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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Examination of available documents and a visual inspection of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some

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deficiencies which require further investigation and remedial action.

Using the Corps of Engineers screening criteria for review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 52 percent of the PMF. The overtopping of the dam could cause the erosion of the west embankment-spillway contact and downstream face of the west embankment resulting in spillway failure, thus increasing the hazard to the loss of life downstream. The spillway is, therefore, considered to be "inadequate".

Structural stability analysis based on available information and the visual inspection indicates that the stability of the spillway section against overturning is inadequate for the loading conditions of maximum ice load at normal pool as well as one half and full PMF. A wet area, detected during the visual inspection(s) along the toe of the east embankment could, depending on the source of the wet area, affect the stability of the east embankment.

It is therefore recommended that within 3 months of notification to the owner, detailed field investigations and monitoring of the source of the wet area and structural stability analysis of the spillway should be initiated.

LAKE ERIE BASIN

BROCTON RESERVOIR

CHAUTAUQUA COUNTY, NEW YORK

INVENTORY NO. N.Y. 785

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Prepared by

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Prepared for

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
NEW YORK, NEW YORK

SEPTEMBER 1980

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

(10) Bert L. /Thomsen /
Gary L. /Wood

PHASE I INSPECTION REPORT

(6) NATIONAL DAM SAFETY PROGRAM.

BROCTON RESERVOIR (Inventory Number

[redacted] N.Y. 785),

LAKE ERIE BASIN,

CHAUTAUQUA COUNTY, NEW YORK.

Phase I Inspection Report,

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

NAME OF DAM:	Brocton Reservoir Inventory No. N.Y. 785
STATE LOCATED:	New York
COUNTY:	Chautauqua
WATERSHED:	Lake Erie
STREAM:	Slippery Rock Creek
DATE OF INSPECTION:	May 14, 15, 22, 1980 See Vicinity Map & Topographic Map, Appendix F

ASSESSMENT

Examination of available documents and a visual inspection of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial action.

Using the Corps of Engineers screening criteria for review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 52 percent of the PMF. The overtopping of the dam could cause the erosion of the west embankment-spillway contact and downstream face of the west embankment resulting in spillway failure, thus increasing the hazard to the loss of life downstream. The spillway is, therefore, considered to be "inadequate".

Structural stability analysis based on available information and the visual inspection indicates that the stability of the spillway section against overturning is inadequate for the loading conditions of maximum ice load at normal pool as well as one half and full PMF. A wet area, detected during the visual inspection(s) along the toe of the east embankment could, depending on the source of the wet area, affect the stability of the east embankment.

It is therefore recommended that within 3 months of notification to the owner, detailed field investigations and monitoring of the source of the wet area and structural stability analysis of the spillway should be initiated.

A number of other deficiencies were noted and if left untreated, these could develop into hazardous conditions. These deficiencies are as follows:

1) A method of preventing or reducing erosion of the shale in the downstream discharge channel below the spillway must be developed and implemented. The selected method of erosion protection must be evaluated in terms of its potential impact on the structural stability of the spillway.
2) All trees and brush must be removed from both the west and east embankments.
3) All cracks and open joints in the spillway must be repaired and refilled.
4) Backfill the erosion gully and divert the surface runoff away from the downstream east abutment-embankment contact.
5) Remove all brush, debris and vegetation from the spillway.
6) Repair cracked and deteriorated grouted stone paving on upstream embankment slopes.
7) Provide a program of periodic maintenance and inspection of the dam and appurtenant structures including yearly operation and lubrication of the reservoir drain valve. The maintenance operations and inspections should be documented for future reference.
8) Develop and implement an emergency preparedness plan for the notification of downstream residents in the event of large spillway discharge.

9. Consideration should be given to permanently relocating the reservoir drain valve to the upstream side of the embankment.

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APPROVED BY:

Colonel W. M. Smith, Jr.
New York District Engineer

View of Crest and Upstream
Slope of East Embankment
from east side of Spillway

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
BROCTON RESERVOIR
I.D. No. N.Y. 785
LAKE ERIE BASIN
CHAUTAUQUA COUNTY, NEW YORK

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority

This Phase I Inspection Report was authorized by the New York State Department of Environmental Conservation by Contract No. D-201458. This study was performed in accordance with the terms of the above contract and the Recommended Guidelines for Safety Inspection of Dams prepared by the Department of Army, Office of the Chief of Engineers to fulfill the requirements of the National Dam Inspection Act, Public Law 93-327.

b. Purpose of Inspection

This inspection was conducted to obtain available data concerning design and construction of the dam, to evaluate that data, to visually inspect existing conditions at the dam, to identify and evaluate deficiencies and/or hazardous conditions which, if present, may threaten life and property of the residents downstream of the dam and to recommend remedial measures to mitigate such deficiencies and hazardous conditions.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam

The Brocton Reservoir Dam consists of an earth dam with a concrete Ogee weir spillway.

The dam embankment consists of compacted soils obtained from the area surrounding the dam. The embankment has a

maximum height of 52 feet, a crest width of 12 feet and a total crest length of 988 feet. The eastern 757 feet of embankment has a crest at elevation 942.0 whereas the western embankment crest elevation is 940.0. The upstream and downstream slopes are 1 vertical on 2.5 horizontal. The upstream slope between 5 feet above and 10 feet below normal pool is protected from wave action by grouted stone paving. The remainder of the upstream slope above normal pool (elevation 933.0) is grass covered. An earth cutoff trench of varying depth and width of 8 feet keys the majority of the eastern embankment into the underlying bedrock (shale) foundation material.

The spillway consists of a concrete Ogee weir 60 feet long with the crest at elevation 933.0. The spillway is excavated in the shale bedrock and keyed into the shale foundation with a 3 foot wide and 4 foot deep key below the weir. The approach apron is 7 feet below the crest elevation. The exit channel has a reinforced concrete slab 12 inches thick seated on 4 inches of stone drainage material over the shale bedrock. The exit channel is 75.8 feet long and has an 8 percent slope. The downstream end of exit channel is also keyed into the bedrock with a 5 foot deep and 2 foot wide concrete key.

The reservoir is drained by a 16 inch cast iron pipe with a manually operated gate valve.

The toe drainage system consists of a trapezoidal drain trench 2 foot deep with a top width of 3 feet and a base width of 2 feet. Seepage is collected from the drain trench into 6 inch diameter drain tile as part of a change order during construction. The toe drain trenches outlet into the former Slippery Rock Creek channel.

b. Location

The Brocton Reservoir Dam is located approximately 1½ miles southeast of the Village of Brocton, New York.

c. Size Classification

The dam is 52 feet high and has a maximum flood storage capacity of 134 acre-feet at the top of the west embankment (elevation 940.0). Therefore, the dam is of intermediate size category by virtue of its height as defined in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

The dam is classified as a high hazard structure due to the presence of the number of mobile homes and other residences along the downstream channel.

e. Ownership

The dam is owned, operated and maintained by the Village of Brocton, New York. The Village Clerk - Mr. Francis Lus, was contacted during the Phase I inspection, his telephone number is 716-792-4160.

The Village Office is at 34 West Main Street, Brocton, New York, 14716. The water filtration plant located near the dam is operated by Mr. Gary Miller, the telephone number at the filtration plant is 716-792-9933.

f. Purpose of the Dam

The purpose of the dam is to impound a backup water supply for the Village of Brocton. The normal water supply is from two much smaller reservoirs located upstream of this dam in the same drainage basin.

g. Design and Construction History

The design of the dam was performed by Nussbaumer and Clarke, Consulting Engineers from Buffalo, New York. The dam was constructed between the Fall of 1951 and the Fall of 1952. The contractor was John B. Schultz Construction Company, Inc. of Buffalo, New York.

h. Normal Operatio 1 Procedure

Normal flows are discharged over the concrete spillway. The elevation of the spillway crest is 933.0. The west embankment crest is at elevation 940.0 and the east embankment is at elevation 942.0. The reservoir has sufficient capacity to store and the spillway to discharge 52% of the Probable Maximum Flood (PMF) without discharge overtopping the west embankment.

1.3 PERTINENT DATA

a. Drainage Area (Sq. Mi.)	3.5
b. Discharge at Damsite (cfs)	
Reservoir Drain at Spillway Crest	17.1
Spillway at ½ PMF (Elev. 939.63)	4080
Spillway at top of west embankment (Elev. 940.0)	4322
c. Elevation (ft. above MSL) (as noted on contract drawings)	
Reservoir Drain Invert	896.0
Spillway Crest and Normal Pool	933.0
Top of West Embankment	940.0
Top of East Embankment	942.0
d. Reservoir	
Length of Normal Pool	1600 ft.
Length of Drainage Basin	18,000 ft.
e. Storage (acre-feet) (as taken from Application for Construction, See Appendix E)	
Normal Pool	245
f. Flood Storage (acre-feet above normal pool)	
Top of West Embankment (Elev. 940.0)	134
g. Reservoir Surface (acres)	
Normal Pool (Contract Engineering Drawings)	16.5
Normal Pool (USGS Basis)	25.6
Top of West Embankment (Contract Engineering Drawings)	21.0
Top of West Embankment (USGS Basis)	38.4

h. Dam (taken from contract drawings)

Type: The dam is a relatively homogeneous embankment composed primarily of clay, silt and sand with keyed earth cutoff trench and toe drains approximately parallel to the east embankment centerline

Length: (ft.)	988
Height: (ft.)	52
Top Width: (ft.)	12
Side Slopes: Upstream and downstream (V:H)	1:2.5

Cutoff: Earth cutoff trench with compacted embankment material under east embankment

Grout Curtain: None

The west embankment is designed not as a dam with toe drains and a cutoff trench, but as a levee or dike section. This section of embankment is 223.5 feet long and has a maximum height above the former ground surface of 18 feet.

i. Spillway

Type: Concrete Ogee weir with crest elevation at 933.0. Entrance channel 7.0' below crest and a 75.8 feet reinforced concrete exit channel on an 8 percent slope. Both upstream face of the Ogee weir and downstream end of the exit channel are keyed into the shale foundation.

Total Length of Weir: 60 ft.

j. Reservoir Drain

Type: 16 inch diameter cast iron pipe

Length: (ft.) 260

Control: Manually operated gate valve in a manhole located at downstream toe of embankment above former Slippery Rock Creek channel.

SECTION 2: ENGINEERING DATA

2.1 GEOTECHNICAL DATA

a. General Geology

The Brocton Reservoir and dam are located approximately 1½ miles southeast of Brocton, New York, on the rim of the Allegheny Plateau, where the Plateau begins to fall away to the lower elevations and glacio-lacustrine environment of the Erie-Ontario lowlands physiographic province.

Local bedrock consists of uplifted and dissected shales with interbedded siltstones of Upper Devonian age. Although the regional dip is southward at a very gentle slope these strata are essentially flat-lying over short distances. The geologic reconnaissance has revealed no major or active faults in the area. The Village of Brocton and Brocton Reservoir are situated in a region classified as Zone 3 seismicity, as shown on Figure No. 1 of the Recommended Guidelines for Safety Inspection of Dams.

Pleistocene glaciation in southwestern New York involved repeated advances and recessions of the continental ice sheet. The terrain was smoothed by glacial scour and the uplands were mantled with thin stony till deposits. Glacial valleys were filled with lacustrine sediments and, subsequently, by granular stratified outwash.

b. Subsurface Investigation

A subsurface investigation was undertaken as part of the design phase. The results of the investigation are shown on the contract drawings. The investigation consisted of a total of 15 test borings advanced along the embankment center line, spillway channel and in borrow areas. All but 4 test borings penetrated the rock surface.

c. Subsurface Conditions

The overburden soils at the dam site and in surrounding borrow areas consisted of about 12 inches of topsoil overlying a heterogeneous mixture of clay, silt, sand, and gravel. Occasional layers of relatively clean sand and gravel were encountered. The underlying bedrock is composed of shale with interbedded siltstone.

2.2 DESIGN RECORDS

The dam was designed by Nussbaumer and Clark, Consulting Engineers of Buffalo, New York who prepared a "Report on Increased Water Supply For Village of Brocton", contract specification;engineering drawings and Application for the Construction to the State of New York, Department of Public Works. Portions of these documents have been appended with this report. Appendix E contains selected pages from the Report,Specifications and Application for Construction where as selected engineering drawings are included in Appendix F.

2.3 CONSTRUCTION RECORDS

Information concerning construction records was limited to 3 change orders made during construction. The first change order concerned additional pipe quantities. The second change order included increased quantities of the earth cut-off trench and toe drainage trenches when excessive ground-water was encountered during construction. The third change order, issued near the completion of the project, included additional rock removal and concrete placement under the Ogee weir portion of the spillway due to the presence of soft rock at the rock surface. Included in Appendix E are selected portions of the contract specifications dealing specifically with earthwork and concrete construction and a 1967 "Report on Water Supply", prepared by George W. Nutbrown, Consulting Engineer which describes portions of the existing construction.

2.4 OPERATION RECORDS

The dam is designed as an uncontrolled water storage structure, therefore, no operating records are maintained regarding reservoir level or spillway discharge. Reportedly, the structure is inspected during periods of high runoff by the Water Filtration Plant Operator and Village Superintendent of Public Works.

2.5 EVALUATION OF DATA

The data presented in this report has been compiled from information obtained from the Village of Brocton and the files of the New York State Department of Environmental Conservation.

The data reviewed in connection with the Phase I inspection were deemed to be adequate and reliable.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

A visual inspection of the dam was conducted on May 14, 15, and 22, 1980. The weather at the time of the initial inspection was cloudy and rainy which resulted in the reinspection on May 15, 1980 during clear and warm weather to better observe any evidence of seepage. The purpose of the May 22, 1980 inspection was to operate the reservoir drain. The reservoir level during all inspections was at the crest of the spillway.

b. Embankment

The embankment was, at the time of the inspections, in good condition with no signs of misalignment, sloughing, seepage, or cracking. The embankment section west of the spillway was heavily wooded, whereas the east embankment is primarily grass covered with scattered brush and small trees less than 3 inches in diameter. Exposed portions of the upstream grouted stone paving is cracked and deteriorated. Selected areas of the stone paving was repaved in 1978 using a lean concrete mix. An erosion gully has developed along the east abutment-embankment contact along the lower half of the east embankment slope. This condition, due to surface runoff, has eroded a gully approximately 2 feet wide and 1 foot deep. A wet area was detected along the toe of the east embankment extending from the central portion of this embankment eastward to the abutment-embankment contact. It is reported this wet area dries up during the summer months.

The toe drainage system consists of drain trenches near the toe of the east embankment trending roughly parallel to the east embankment centerline. The drain trenches are cut into the natural soils and are backfilled with processed gravel or crushed stone. No discharge was observed from the drains on the inspection dates noted above.

c. Spillway

The spillway is an uncontrolled sixty (60) foot wide concrete Ogee weir. The crest of the spillway at elevation 933.00 and is 7 feet above the concrete approach apron channel. The concrete Ogee section of the spillway is keyed into the bedrock foundation with a 3 foot wide and 4 foot deep key running the entire length of the weir. The concrete wingwalls rising above the crest are provided with keys into the embankment materials. The entrance channel, Ogee section, exit channel and wingwalls are all founded of shale bedrock. The exit channel slopes away from the Ogee section at an 8 percent slope to the downstream channel. The exit channel is provided with a gravel or stone drainage blanket and weep holes near the downsteam end of the exit channel.

In general, the exposed concrete was in good condition. Minor cracking of the exit channel base was detected. Small brush is growing in the joint between the base of the exit channel and the wingwalls. Debris has collected within the spillway.

Severe erosion of the shale in the downstream channel has exposed the base of the concrete wingwalls and the Key way provided at the downstream edge of the exit channel. (See Photos in Appendix A).

d. Reservoir Drain

The reservoir is drained by a 16 inch cast iron pipe and a manually operated gate valve located in a manhole on the downstream slope just above the former Slippery Rock Creek channel. The gate is in operable condition and was operated on May 22, 1980.

e. Downstream of Toe

An area west of the Slippery Rock Creek channel was designated on the contract drawings to be a rock spoil area. This area is covered with brush and small trees. A wet area existed during the field inspection downstream of the east embankment toe from the outlet of the reservoir drain eastward to the abutment-embankment contact. This wet area extends approximately 25 to 30 feet beyond the toe near the pump station.

f. Downstream Channel

The downstream channel beyond the spillway for a distance of 315 feet was excavated in rock to the Slippery Rock Creek channel. The planned channel invert as shown on the contract drawings has an 8 percent grade and a width of 60 feet. The inspection revealed the downstream channel has been eroded significantly. We estimate the depth of erosion, just downstream of the spillway, to be on the order of 12 feet.

g. Reservoir Area

The immediate area surrounding the reservoir is wooded with slopes ranging from less than 10 percent to about 25 percent. No signs of slope instability were observed.

3.2 EVALUATION OF OBSERVATIONS

The visual inspection of this dam revealed the following deficiencies: (in order of severity)

1) Severe erosion of shale downstream of spillway.
2) Wet area along downstream toe of east embankment east of Slippery Rock Creek channel.
3) Heavy growth of trees and brush on west embankment crest and slopes.
4) Minor cracking of spillway exit channel base.
5) Erosion gully along downstream east abutment-embankment contact of east embankment.
6) Growth of small brush in spillway at joint of the exit channel base and the wingwalls.
7) Scattered cracking and deterioration of grouted stone paving on upstream slope of east embankment.

8) Minor growth of brush and small trees on downstream slope of the east embankment.

9) Debris within the spillway.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The normal reservoir level is controlled by the crest elevation of the concrete Ogee section. Downstream flow is limited by the flow over the spillway crest. The reservoir has sufficient capacity to store and discharge 52 percent of the PMF before overtopping the west embankment. At full PMF the main (east embankment) dam is not overtopped.

The reservoir water is used only as a back-up supply when demand exceeds the available supply from the upstream Burr and Risley Reservoirs. The reservoir water passes through a 10 inch diameter CIP from a headwall near the toe of the upstream east embankment through the embankment to a pump house where the water is then pumped to the water filtration plant.

The reservoir drain is reportedly operated at least once a year and before any reservoir water is pumped to the water filtration plant.

4.2 MAINTENANCE OF DAM

The dam is maintained by the owner, Village of Brocton. There is no formal maintenance program. Previous maintenance has included the cutting of trees and brush on the east embankment slopes, mowing of the east embankment crest and patching selected cracked and deteriorated section of the grouted upstream stone paving on the east embankment.

4.3 WARNING SYSTEM IN EFFECT

There is no warning system or evacuation plan in effect. The structure has, in the past, been monitored by Village personnel during periods of heavy run-off.

4.4 EVALUATION

The operation procedure for this sturcture is satisfactory, however, increased maintenance is required to correct deficiencies noted in Section 3.2.

SECTION 5: HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

Delineation of the water shed draining into the reservoir pool area was made using the USGS 7.5 minute quadrangles for Brocton and Hartfield, New York. The drainage area measures 3.5 square miles and consists predominately of wooded land along with some open fields and marshland. The relief in the area consists of gentle to moderately sloped hills that surround the reservoir to the east, west, and south. There are two other small reservoirs within the watershed, but they are not taken into consideration because of their minimal storage.

5.2 ANALYSIS CRITERIA

The analysis of the floodwater retarding capability of this dam was performed using the Corps of Engineers HEC-1 computer program, Dam Safety Version. This program develops an inflow hydrograph based upon the "Snyder Synethetic Unit Hydrograph" and then uses the "Modified Puls" flood routing procedure. The spillway design flood selected for analysis was the PMF in accordance with the Recommended Guidelines of the U. S. Army Corps of Engineers.

5.3 SPILLWAY CAPACITY

A sixty (60) foot long concrete Ogee section serves as the only spillway for the Brocton Reservoir Dam.

The spillway does not have sufficient capacity for discharging the peak outlfow from the Probable Maximum Flood (PMF), but does have adequate capacity for discharging one-half the PMF.

The development of the inflow hydrograph and flood routing procedure for this structure was based on the reservoir stage-storage characteristics as determined from both the

contract engineering drawings and the U.S.G.S. 7.5 minute quadrangle for Hartfield, New York. The results of the analysis from the differing datum are as follows:

Basis	Inflow (cfs) PMF	Inflow (cfs) 1/2 PMF	Outflow (cfs) PMF	Outflow (cfs) 1/2 PMF
Contract Drawings	8,255	4,128	8,252	4,080
U.S.G.S.	8,234	4,117	8,211	3,972

The computed spillway capacity for a water surface elevation at the top of the west embankment (elevation 940.0) is 4,322 cfs which is based on a weir coefficient varying between 3.2 and 3.9 as the stage increases from the spillway crest to the top of the west embankment. It should be noted that the dam has a differential crest elevation, the 940.0 elevation applies to the top of dam west of the spillway, whereas, the top elevation of the dam to the east of the spillway is at elevation 942.0.

5.4 RESERVOIR CAPACITY

From data presented in the Application for Construction the reservoir has sufficient capacity to store 245 acre-feet at the spillway crest elevation.

The reservoir surface at the spillway crest elevation was determined using both the contract engineering drawings and the U.S.G.S. 7.5 minute quadrangle for Hartfield, New York. Based on these two different topographic sources, the flood storage capacity of the reservoir at the top of the west embankment is as follows:

Basis	Reservoir Surface (Acres)	Flood Storage at Top of West Embankment (Acre-Feet)
Contract Drawing	16.5	133
U.S.G.S.	25.6*	224

*Note that the water surface is shown on the U.S.G.S. sheet at about elevation 925, which is below the actual spillway elevation of 933. Therefore, this area is that inscribed by an interpolated contour.

5.5 FLOODS OF RECORD

Due to the lack of reliable information, no attempt was made to estimate the discharge of the flood of record.

5.6 OVERTOPPING POTENTIAL

Analysis using the more conservative PMF result indicates that the dam does not have sufficient spillway capacity. For a PMF peak outflow of 8,255 cfs, the west embankment would be overtopped to a computed depth of 1.93 feet. The west embankment would be overtopped by all storms exceeding 52% of the PMF, however, the east embankment would not be overtopped at the PMF.

5.7 EVALUATION

The difference in the reservoir surface area between that obtained using the contract engineering drawings and the U.S.G.S. sheet has little influence on the reservoir storage capacity and the spillway capacity for discharging the outflow for one-half the PMF. The spillway is capable of passing between 52 and 54 percent of the PMF depending on the stage-storage characteristics from the contract drawings and the U.S.G.S. sheet, respectively.

We note a weir coefficient of 3.0 was used in the stage-discharge computation for the west embankment which is heavily wooded.

Discharge over the west embankment could result in serious erosion of the embankment and potential undermining of the spillway. The discharge in the downstream channel would be controlled by the magnitude of embankment erosion which cannot be evaluated.

Based on the available data, the spillway is considered inadequate.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

No signs of instability were observed in connection with this structure, however, continued headward erosion of the discharge channel downstream of the spillway could undermine the spillway exit channel and wingwalls if left untreated.

b. Design and Construction Data

A few documents concerning spillway design and stability were available for review. These documents included computations of spillway discharge capacity, overturning stability and maximum foundation pressures. For spillway stability, two cases had been analyzed, that of a high water condition with the reservoir level at elevation 940.0 and a case of no water pressure against the spillway. Since the available stability computations did not take into account ice and earthquake forces additional spillway stability analyses were performed. No record of embankment stability analyses was available.

A review of the recommended design parameters* for a homogeneous earth embankment of recompacted clay, silt, sand and gravel materials indicates that side slopes of 1 vertical on 2.5 horizontal are reasonable in terms of embankment stability.

The crest width of 12 feet is somewhat narrow for earth embankments with a maximum height of 52 feet. The cutoff trench width and depth is in accordance with normally accepted design.

---

*"Design of Small Dams", U.S. Department of Interior, Bureau of Reclamation, 1977.

The details of the internal drainage system do not conform with generally accepted design concerning the depth, width and filter criteria. Of these features, the filter criteria appears to be the most critical. The backfill for the trenches as shown on the contract drawings is composed of a 6 inch thick layer of #2 stone (or graded gravel) over 18 inches of #4 stone (or graded gravel). This material is both poorly graded and not suitable as filter material against the foundation soils composed of a heterogeneous mixture of clay, silt, sand and gravel.

Design of the upstream slope protection is more than adequate for the reservoir size (fetch) and a sustained maximum wind velocity of 75 miles per hour.

Cross-sections of the spillway shown on the contract drawings in Appendix F were used to perform a structural stability analysis. The following cases with varying loading conditions were analyzed.

a. Normal Pool with the reservoir at the spillway crest.

b. One-half PMF, water flowing over the spillway crest at a depth of 6.63 feet.

c. PMF, water flowing over the spillway crest at a depth of 8.91 feet.

The details of the analysis are contained in Appendix D and are summarized in the following table:

BROCTON RESERVOIR SPILLWAY

SUMMARY OF STABILITY ANALYSES

CASE	LOADING CONDITIONS				FACTOR OF SAFETY		Resultant within Middle 1/3	Resultant within Base
	Full Uplift	1/2 Uplift	Ice	Seismic (Zone 3)	Overturning	Sliding		
a) Normal Pool		X			3.81	53.2	Yes	
	X				2.30	52.7	Yes	
		X	X		1.73	21.8	Yes	
	X		X		1.33	21.6	No*	
		X	X	X	1.59	17.7	No	Yes
	X		X	X	1.24	17.5	No	Yes
b) 1/2 PMF		X			2.25	27.6	Yes	
		X		X	1.97	20.65	Yes	
	X				1.45	27.13	Yes	
	X			X	1.32	20.3	No	Yes
c) PMF		X			1.97	23.7	Yes	
		X		X	1.74	18.2	Yes	
	X				1.28	23.3	No*	
	X			X	1.18	17.9	No	Yes

*NOTE: This is a non-seismic loading condition and resultant of applied loads falls outside middle third of base.

The analyses indicates sliding safety factors are more than adequate under all loading conditions. For static overturning stability the resultant of the applied forces is outside the middle third of the structure for 2 of the 8 loading conditions investigated.

The stability of the spillway is highly sensitive to the magnitude and distribution of the hydrostatic uplift pressures. In order to fully evaluate the structural stability of the spillway we recommend additional field investigations be undertaken to determine the distribution and magnitude of hydrostatic uplift pressure for this structure. This data should then be utilized to analyze the stability of the spillway.

c. Seismic Stability

The dam is situated in Seismic Zone 3, therefore, a seismic stability analyses was performed based on the Zanger hydrodynamic pressure distribution which is similar to the Westergaard distribution recommended by the Corps of Engineers guidelines. The analysis was performed under normal pool, half PMF and full PMF. The results are tabulated above and it appears that under all loading conditions including seismic loads the structure is adequately stable and the resultant of all forces is within the base.

SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

The Phase I inspection of the Brocton Reservoir dam did not reveal conditions which constitute an immediate hazard to human life or property. Based on the available data the spillway is capable of passing at least 52 percent of the PMF and therefore the spillway is judged to be "inadequate". The structural stability analysis indicates the spillway would not be stable for several loading conditions.

The wet area along the downstream toe of the east embankment could constitute a potential hazard if the source of the wet area is from seepage through the embankment or along the abutment-embankment contact.

b. Adequacy of Information

The available documents reviewed as part of the Phase I inspection is adequate with the exception of the reservoir surface area discrepancy between that calculated using the U.S.G.S. 7 1/2 minute topographic map of the Hartfield, New York quadrangle and the contract drawings.

c. Need for Additional Investigations

Field investigations and monitoring should be undertaken to determine the source of the wet area along the downstream toe of the east embankment.

In addition, field investigations should be directed to determine the actual distribution and magnitude of hydrostatic uplift pressures at the base of the spillway as well as the spillway foundation material shear strength parameters.

Based on the data obtained from the field investigations additional analysis should be performed to evaluate the significance of the source of the wet area and spillway structural stability.

A method of preventing or reducing erosion of the shale in the downstream channel should be devised and implemented. In addition, the consequences of the proposed method(s) should be evaluated in terms of its affect on altering the hydrostatic uplift pressures and consequent spillway stability.

7.2 RECOMMENDED REMEDIAL MEASURES (In order of priority)

a) Further erosion of the downstream discharge channel below the spillway must be prevented.

b) All trees and brush should be removed from both the west and east embankment slopes.

c) All cracks and joints in the spillway should be repaired.

d) The erosion gully along the downstream east abutment-embankment contact should be at least regraded and seeded.

e) All brush, debris and other vegetation should be removed from the spillway.

f) Repair cracked and deteriorated grouted stone paving on upstream embankment slopes.

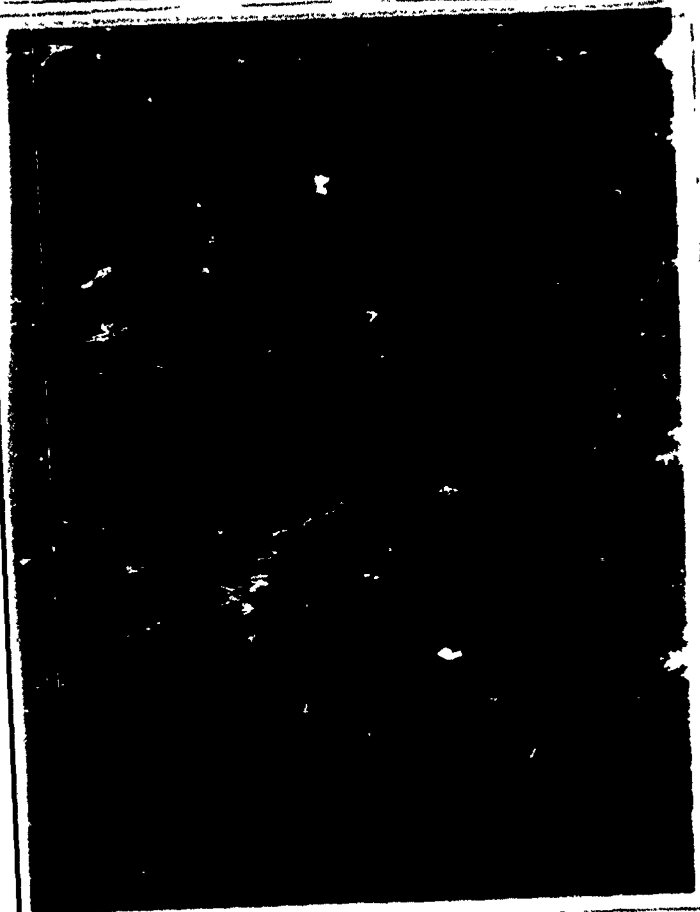
g) An emergency action plan should be developed and implemented for notification of downstream residents in the event of large spillway discharge.

h) Additional remedial measures may be required depending on the results of the additional field investigations and analyses.

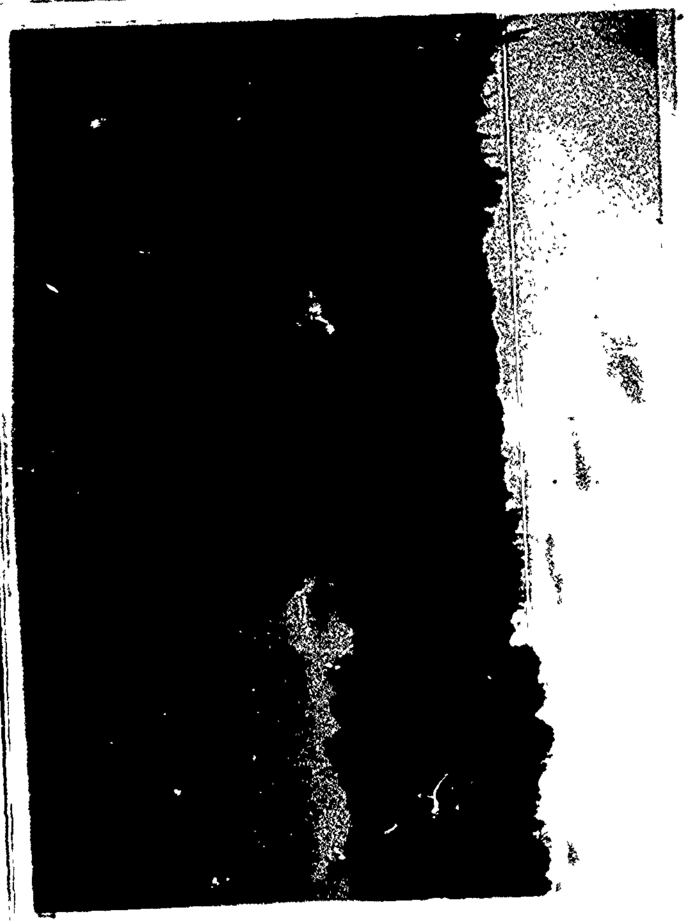
i) When and if the reservoir is drained, consideration should be given to relocating the reservoir drain valve to the upstream side of the embankment and thereby prevent the drain pipe from being constantly pressurized.

APPENDIX A

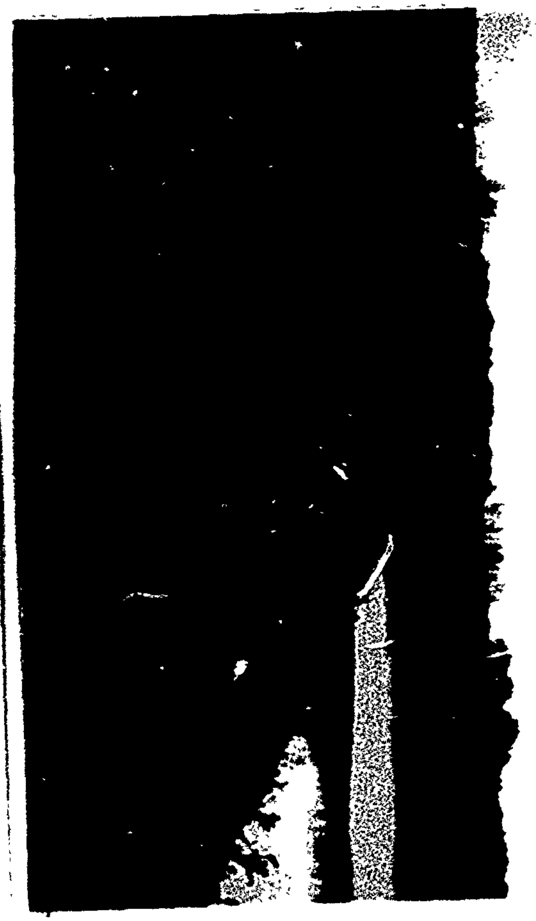
PHOTOGRAPHS



View of Downstream Slope of Last Embankment and Pumping Station from Crest Note: Brush and Small Trees on Slope

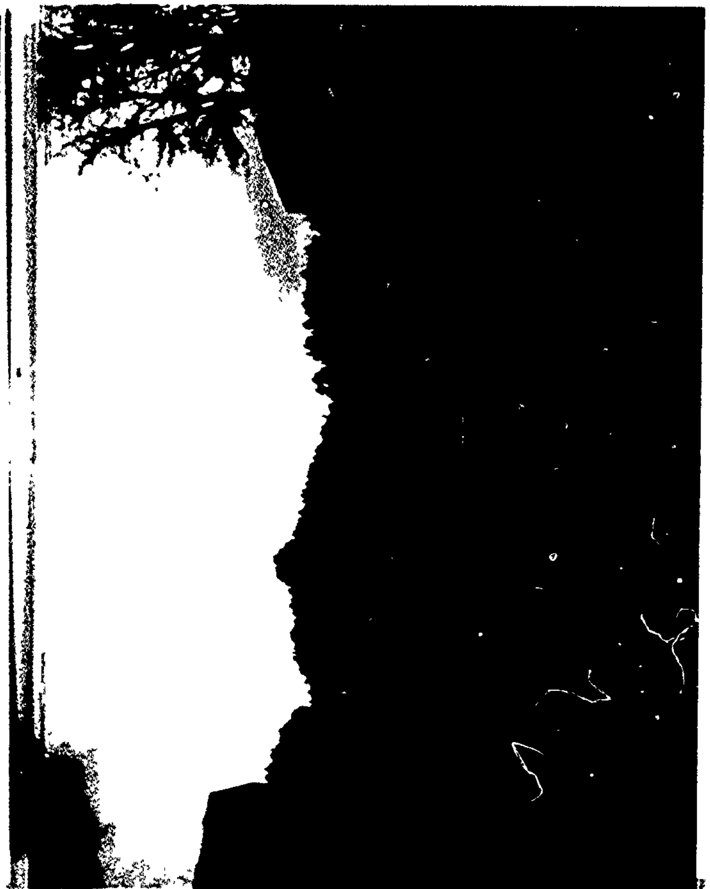


View of Upstream Slope of East Embankment. Note Crack grouted Stone Paving.

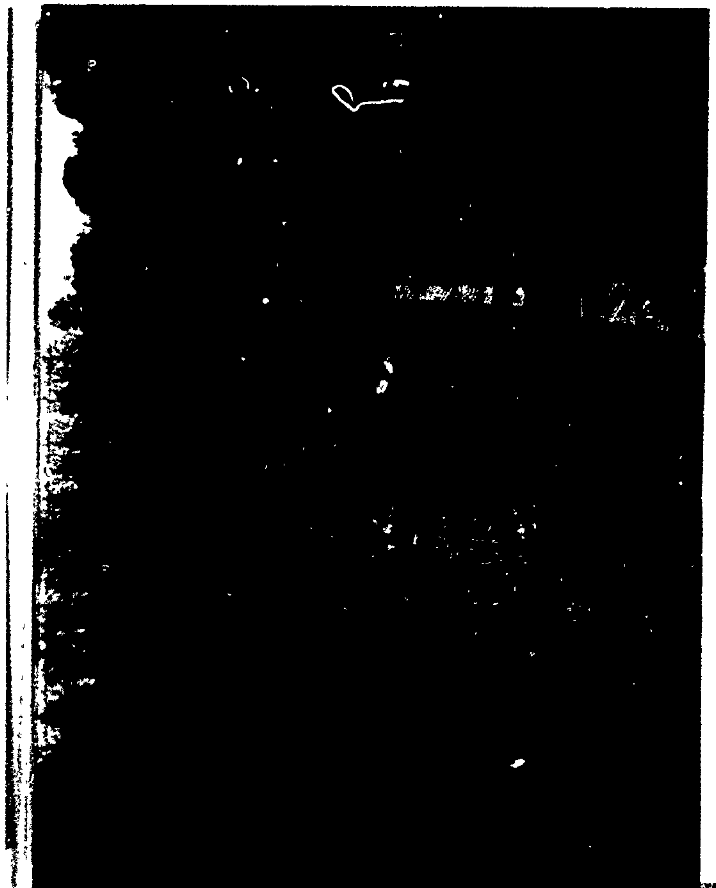


View of Crest and Upstream Slope of East Embankment from east side of Spillway.

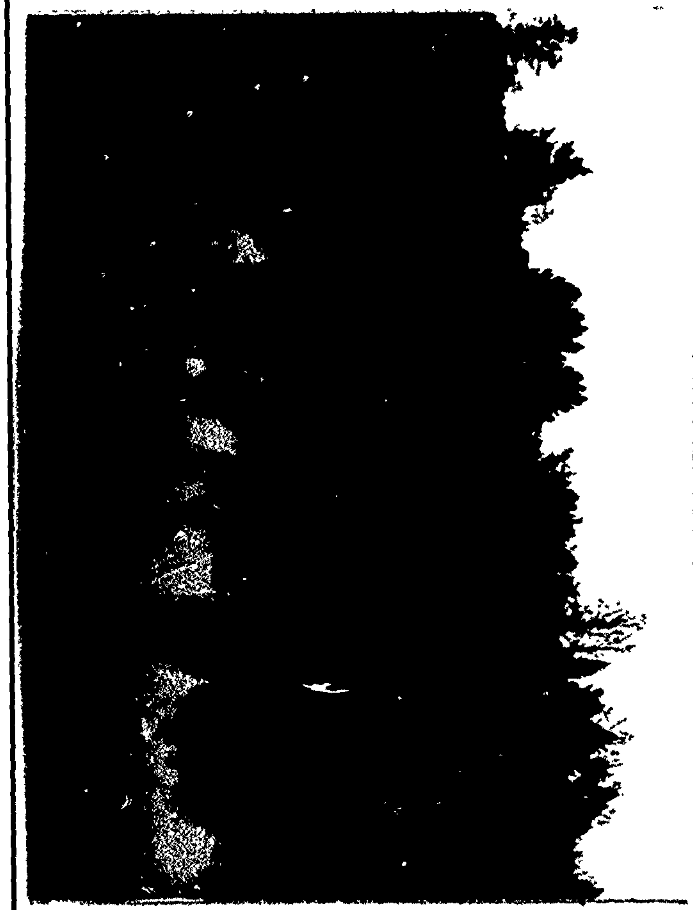
View of Spillway & Downstream Channel Note: Trees on West Embankment (Right of Spillway) & eroded shale in downstream channel.



View of Spillway
Note: Debris



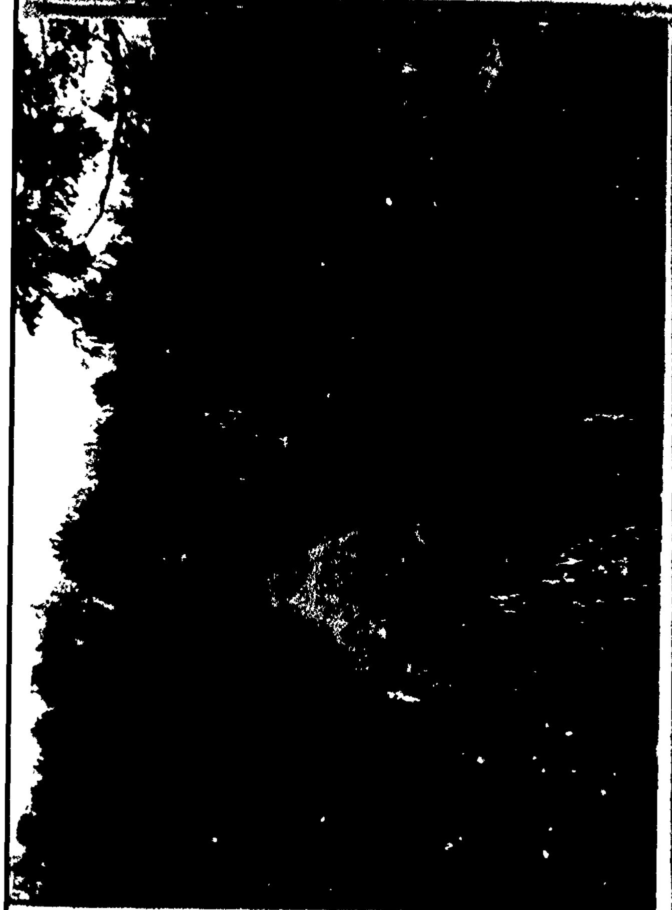
View of Spillway Exit Channel and Downstream Channel



View of Crest and Upstream Slope of North Embankment for Burr Reservoir.

View of Reservoir Drain Outlet pipe (Former Slippery Rock Creek Channel)

View of Downstream Channel from Spillway. Note: Eroded shale in channel.



e

View of Crest and Downstream
Slope of North Embankment
for Burr Reservoir.

APPENDIX B

VISUAL INSPECTION CHECKLIST

THOMSEN ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS & GEOLOGISTS

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam Brocton Reservoir

I.D. # 30-646 DEC. Dam No. [illegible] 785

River Basin Lake Erie

Location: Town [illegible] County Chautauqua

U.S.G.S. Quadrangle [illegible]

Stream Name [illegible]

Tributary of Lake Erie

Latitude (N) 42°22.2' Longitude (W) 79°25.6'

Type of Dam Earth Embankment - Concrete Spillway

Hazard Category [illegible]

Date(s) of Inspection [illegible], 5/15/80, 5/22/80

Weather Conditions [illegible] - 5/14, [illegible] 5/15 & 5/22/80

Reservoir Level at Time of Inspection 933.0 (1" over [illegible])

Tailwater Level at Time of Inspection 900 ± (12'-15' below [illegible] exit apron)

b. Inspection Personnel [illegible]

[illegible] F Waidt - McFarland - Johnson Engineers

c. Persons Contacted (Including Address & Phone No.)

[illegible] Filtration Plant

Operators - [illegible] 1-716-792-9533

Village Clerk - Francis Lus, 34 West Main St. Brocton NY 14716

1-716-792-4160

d. History:

Date Constructed 1951 & 1952 Date(s) Reconstructed 1978

Designer Nussbaumer & Clark, Buffalo NY

Constructed by J. B. Schultz Co. Inc. Buffalo, N.Y.

Owner Village of Brocton

e. Seismic Zone [illegible]

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2) Embankment

a. Characteristics

1) Embankment Material *Native Soils from Surrounding Borrow Pits (Clay, Silt Sand & Gravel)*

2) Cutoff Type *Earth Cutoff Trench w/ [illegible] embankment material*

3) Impervious Core *NONE*

4) Internal Drainage System *Toe Drain [illegible]*

5) Miscellaneous

b. Crest

1) Vertical Alignment *Good*

2) Horizontal Alignment *Good*

3) Surface Cracks *NONE*

4) Miscellaneous

c. Upstream Slope

1) Slope(Estimate)(V:H) *1:2.5*

2) Undesirable Growth or Debris, Animal Burrows *NONE*

3) Sloughing, Subsidence or Depressions *NONE*

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4) Slope Protection [illegible]
(Max Particle Size 2-3")

5) Surface Cracks or Movement at Toe Cracking in Slope protection @ [illegible]

d. Downstream Slope

1) Slope (Estimate - V:H) 1:2.5

2) Undesirable Growth or Debris, Animal Burrows Some brush and small diameter tree (3" Max). Tree cutting has taken place in the past

3) Sloughing, Subsidence or Depressions None

4) Surface Cracks or Movement at Toe None

5) Seepage Wet area near Dam Toe

6) External Drainage System (Ditches, Trenches; Blanket)
Drainage swale @ Abutment [illegible]

7) Condition Around Outlet Structure Conduit in fairly good condition some [illegible], no heavy growth

8) Seepage Beyond Toe Wet area near [illegible]
Wet area beyond [illegible]

e. Abutments-Embankment Contact

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VISUAL INSPECTION CHECKLIST

1) Erosion at Contact Slight Erosion along east abutment-embankment contact

2) Seepage Along Contract

3) Drainage System

a. Description of System Toe Drain Trenches Outleting at Former Slippery Rock Creek Channel

b. Condition of System Unobservable

c. Discharge from Drainage System None Observed

4) Instrumentation (Monumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.) None

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VISUAL INSPECTION CHECKLIST

5) Reservoir

a. Slopes Gentle Slopes - No Signs of Instability
Slopes from <10 % to about 25 %

b. Sedimentation Unobservable

c. Unusual Conditions Which Affect Dam 2 Upstream
Reservoirs in Same Drainage Basin

6) Area Downstream of Dam

a. Downstream Hazard (No. of Homes, Highways, etc.) Many
Mobile Homes in Floodplain Downstream of 1st Bridge

b. Seepage, Unusual Growth None

c. Evidence of Movement Beyond Toe of Dam None

d. Condition of Downstream Channel Erosion of Shale
Bedrock Downstream of Spillway

7) Spillway(s) (Including Discharge Conveyance Channel)

a. General Concrete Weir

b. Condition of Service Spillway [illegible]
[illegible] EDGES [illegible]
[illegible]
[illegible]

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VISUAL INSPECTION CHECKLIST

c. Condition of Auxiliary Spillway None

d. Condition of Discharge Conveyance Channel Erosion of Shale Bedrock along entire Channel, Approximately 12-15 ft. of Erosion downstream of Spillway

8) Reservoir Drain/~~Outlet~~

Type: Pipe ✓ Conduit ______ Other ______

Material: Concrete ______ Metal CIP Other ______

Size: 16" diameter Length 230 feet

Invert Elevations: Entrance 896.0 Exit 896.0

Physical Condition (Describe): Unobservable ✓

Material: ______

Joints: ______ Alignment ______

Structural Integrity: ______

Hydraulic Capability: ______

Means of Control: Gate ✓ Valve ______ Uncontrolled ______

Operation: Operable ✓ Inoperable ______ Other ______

Present Condition (Describe): Gate opened on May 22 1980 and flow allowed through pipe for approximately 30 minutes.

Misc: No Warning System or Evacuation Plan

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9) Structural

a. Concrete Surfaces Good Condition

b. Structural Cracking Minor Cracks exposed in Spillway Exit Channel

c. Movement - Horizontal & Vertical Alignment (Settlement)
NONE

d. Junctions with Abutments or Embankments Good

e. Drains - Foundation, Joint, Face Gravel Drainage Blanket 4" thick below Base of Spillway Exit Channel

f. Water Passages, ~~Conduits, Sluices~~ Ogee Spillway

g. Seepage or Leakage NONE

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h. Joints - Construction, etc. Small Brush growing along joint Between

i. Foundation NOT OBSERVED

j. Abutments NOT APPLICABLE

k. Control Gates NONE

l. Approach & Outlet Channels Approach - unobserved
Outlet - Good Condition, some minor cracking of spillway exit channel

m. Energy Dissipators (Plunge Pool, etc.) NONE

n. Intake Structures NONE

o. Stability APPEARED STABLE

p. Miscellaneous

APPENDIX C

HYDROLOGIC/HYDRAULIC ENGINEERING
DATA AND COMPUTATIONS

THOMSEN ASSOCIATES

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

Contract Drawings / USGS

AREA-CAPACITY DATA:

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam	940.0 West Side 942.0 East Side	210/39.4	378/469
2) Design High Water (Max.Design Pool)	940.0	210/39.4	378/469
3) Auxiliary Spillway Crest	N.A.	N.A.	N.A.
4) Pool Level with Flashboards	N.A.	N.A.	N.A
5) Service Spillway Crest	933.0		245

DISCHARGES

	Volume (cfs)
1) Average Daily	Unknown
2) Spillway @ Maximum High Water (Elev. 940.0)	4322
3) Spillway @ Design High Water	N.A
4) Spillway @ Auxiliary Spillway Crest Elevation	N.A.
5) Low Level Outlet (Reservoir Drain)	17
6) Total (of all facilities) @ Maximum High Water	4339
7) Maximum Known Flood	Unknown

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CREST:

WEST EMBANKMENT ELEVATION: 940.0
EAST EMBANKMENT 940.0

Type: Compacted Earth

Width: 12 feet Length: West - 223.5 feet, East - 7570 feet

Spillover CONCRETE OGEE WEIR

Location NEAR WEST SIDE OF RESERVOIR

SPILLWAY:

PRINCIPAL		"EMERGENCY" WEST EMBANKMENT
933.0	Elevation	940.0
Ogee Weir	Type	Earth Embankment
60 feet	Width	223.5 feet

Type of Control

Uncontrolled	Uncontrolled	Uncontrolled
	Controlled:	
	Type (Flashboards; gate)	
	Number	
	Size/Length	
	Invert Material	Compacted Clay, Silt, Sand & Gravel
	Anticipated Length of operating service	4.5 hours @ PMF
75.8 feet	Chute Length	Not Applicable
7 feet	Height Between Spillway Crest & Approach Channel Invert (Weir Flow)	Not Applicable

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~~OUTLET STRUCTURES~~/EMERGENCY DRAWDOWN FACILITIES:

Type: Gate ✓ Sluice ____ Conduit ____ Penstock ____

Shape: Circular

Size: 16 inch

Elevations: Entrance Invert 896.0

Exit Invert 896.0

Tailrace Channel: Elevation 896.0

HYDROMETEROLOGICAL GAGES:

Type: ____

Location: Nearest Meterological Gage at Fredonia, New York Cornell Experimental Station

Records:

Date - Records Available from 1935 to Present

Max. Reading - ____

FLOOD WATER CONTROL SYSTEM:

Warning System: No

Method of Controlled Releases (mechanisms):

Reservoir Drain

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DRAINAGE AREA: 3.5 square miles (U.S.G.S Basis 7½ minute Quadrangle Hartfield, N.Y)

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Forested · Pasture Land

Terrain - Relief: Gentle to Moderate (10-25% slopes)

Surface - Soil: Clay, Sand, Silt & Gravel over Shale Bedrock

Runoff Potential (existing or planned extensive alterations to existing surface or subsurface conditions)

None

Potential Sedimentation problem areas (natural or man-made; present or future)

Upstream Reservoirs (Burr and Risley) act as settling basins for Brocton Reservoir

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the Reservoir perimeter:

Location: West Embankment lower than East Embankment

Elevation: 940.0

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DRAINAGE AREA - 3.5 sq. mile

ESTIMATION OF LAG TIME (tp)

$$tp = Ct(.955)(L.Lc)^{.3} + .25\,tR$$
$$= 1.7(.955)(3.41 \times 1.14)^{.3} + .25(.5)$$
$$= 2.56 \text{ hr.}$$

L = 18000 ft. = 3.41 mile
Lc = 6000 ft. = 1.14 mile

Check of Lag time

$$\text{Slope of the basin} = \frac{1430 - 1000}{13400} \times 100 = 3.2\%$$

Using Linsley, Kohler & Paulhus Equn. :

$$\text{Lag }(tp) = 0.72\left(\frac{L.Lc}{\sqrt{S}}\right)^{.38}$$
$$= 0.72\left(\frac{3.41 \times 1.14}{\sqrt{.032}}\right)^{.38} = 2.32 \text{ hr.}$$

In HEC-1 input tp = 2.56 hr. & Cp = 0.63 were used to develop Snyder's unit hydrograph.

PROBABLE MAXIMUM PRECIPITATION

From Hydrometeorological Report # 33, Probable Maximum Precipitation = 22.7 inches (For 200 sq. mile - 24 hr. duration)

Depth - Area - Duration Relationship (Zone 2)

6 hr.	- 116%
12 hr.	127%
24 hr.	141%

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JOB HYDROLOGIC STUDY DAM # NY785
SHEET NO. 2 OF 4
CALCULATED BY P.S. DATE [illegible]
CHECKED BY DATE
SCALE

STAGE-STORAGE DATA (Based on U.S.G.S. Topo. Sheet)

ELEVATION (FT.)	SURFACE AREA (ACRES)	AVG. AREA (ACRES)	INCREMENTAL STORAGE (ACRE-FT.)	TOTAL STORAGE (ACRE-FT.)	REMARKS
933	25.6			0	Surface Area
		32.0	224		are estimated
940	38.4			224	from U.S.G.S.
		49.8	498		quadrangle
950	61.2			722	'Hartfield', N.Y.

Note: Storages in Burr and Risley reservoir were not considered.

STAGE-DISCHARGE COMPUTATION

Normal Pool Elevation - 933.0 Length of Spillway - 60'
West Embankment Elevation - 940.0 Length of West Embankment - 223.5
East Embankment Elevation - 942.0 Length of East Embankment 765'

Assumptions:

1. Coefficient of discharge varies with the head on spillway.
2. Spillway design head = 7'

Note: Tailwater elevation was computed in the spillway channel of bottom width of 60 feet and slope of 8% with the maximum discharge from the spillway. Tailwater does not submerge the crest.

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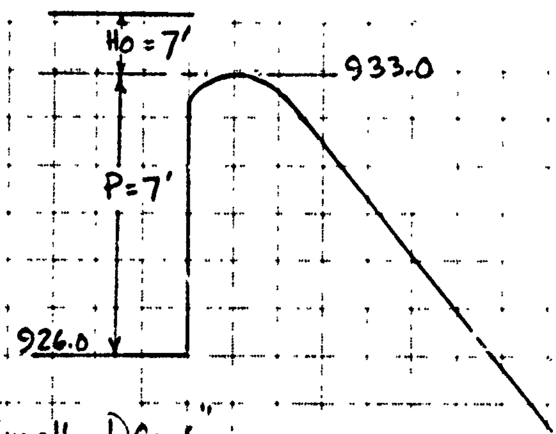
JOB: HYDROLOGIC STUDY DAM # [illegible]
SHEET NO: 3 OF 4
CALCULATED BY: P.S. DATE: [illegible]
CHECKED BY: DATE:
SCALE:

STAGE-DISCHARGE COMPUTATIONS (CONT'D.)

Design Head = H_o = 7'
Actual head = H_e
From Fig. 249, PP. 378 of "Design of Small Dams"



$P/H_o = 7/7 = 1.0$ $C_o = 3.89$

From Fig. 250 of "Design of Small Dams"

He @ 1'	$H_e/H_o = 1/7 = .14$	$C/C_o = .834$	$C = .834(3.89) = 3.24$
He @ 2'	$H_e/H_o = 2/7 = .28$	$C/C_o = .871$	$C = .871(3.89) = 3.39$
He @ 3'	$H_e/H_o = 3/7 = .43$	$C/C_o = .906$	$C = .906(3.89) = 3.52$
He @ 4'	$H_e/H_o = 4/7 = .57$	$C/C_o = .932$	$C = .932(3.89) = 3.63$
He @ 5'	$H_e/H_o = 5/7 = .71$	$C/C_o = .958$	$C = .958(3.89) = 3.73$
He @ 6'	$H_e/H_o = 6/7 = .86$	$C/C_o = .981$	$C = .981(3.89) = 3.82$
He @ 7'	$H_e/H_o = 7/7 = 1.0$	$C/C_o = 1.0$	$C = 1.0(3.89) = 3.89$
He @ 8'	$H_e/H_o = 8/7 = 1.14$	$C/C_o = 1.018$	$C = 1.018(3.89) = 3.96$
He @ 9'	$H_e/H_o = 9/7 = 1.28$	$C/C_o = 1.038$	$C = 1.038(3.89) = 4.04$

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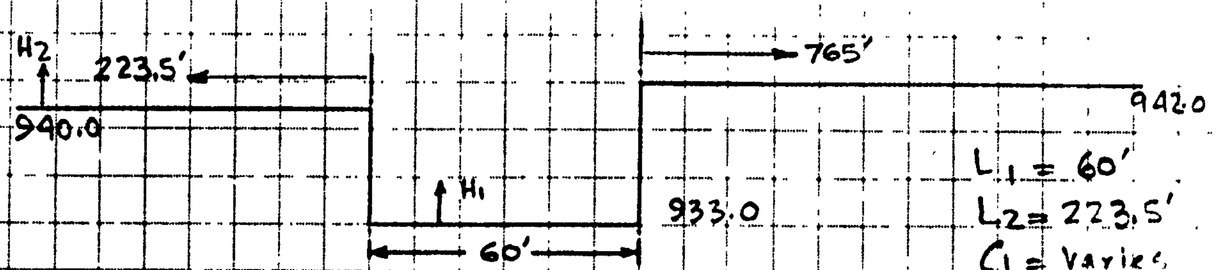
BINGHAMTON, NEW YORK 13905

JOB: HYDROLOGIC STUDY [illegible]
SHEET NO 4 OF 4
CALCULATED BY P.S. DATE 6/2?/80
CHECKED BY ______ DATE ______
SCALE ______

STAGE - DISCHARGE COMPUTATIONS (CONT'D.)

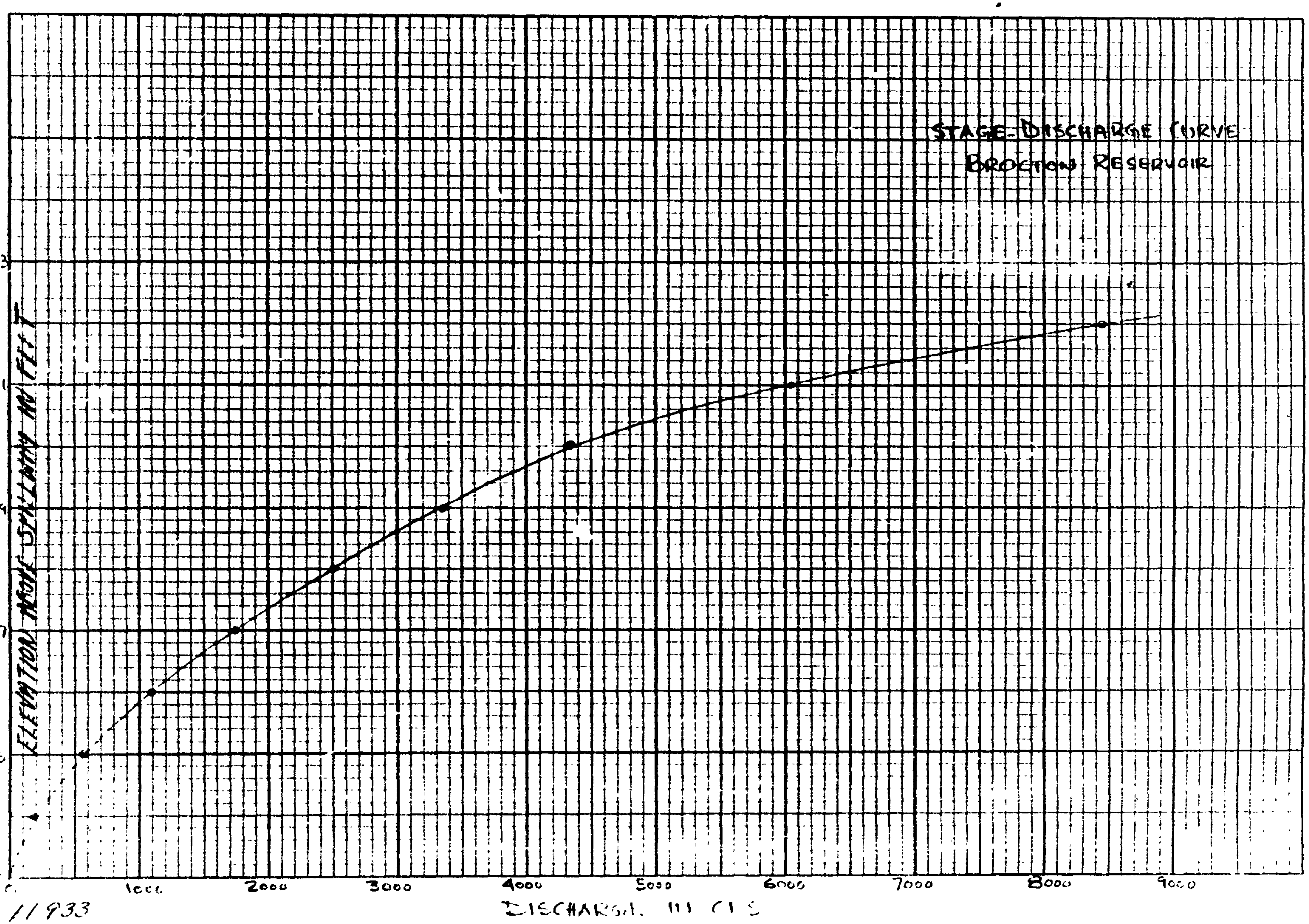


$L_1 = 60'$
$L_2 = 223.5'$
C_1 = Varies
$C_2 = 3.0$

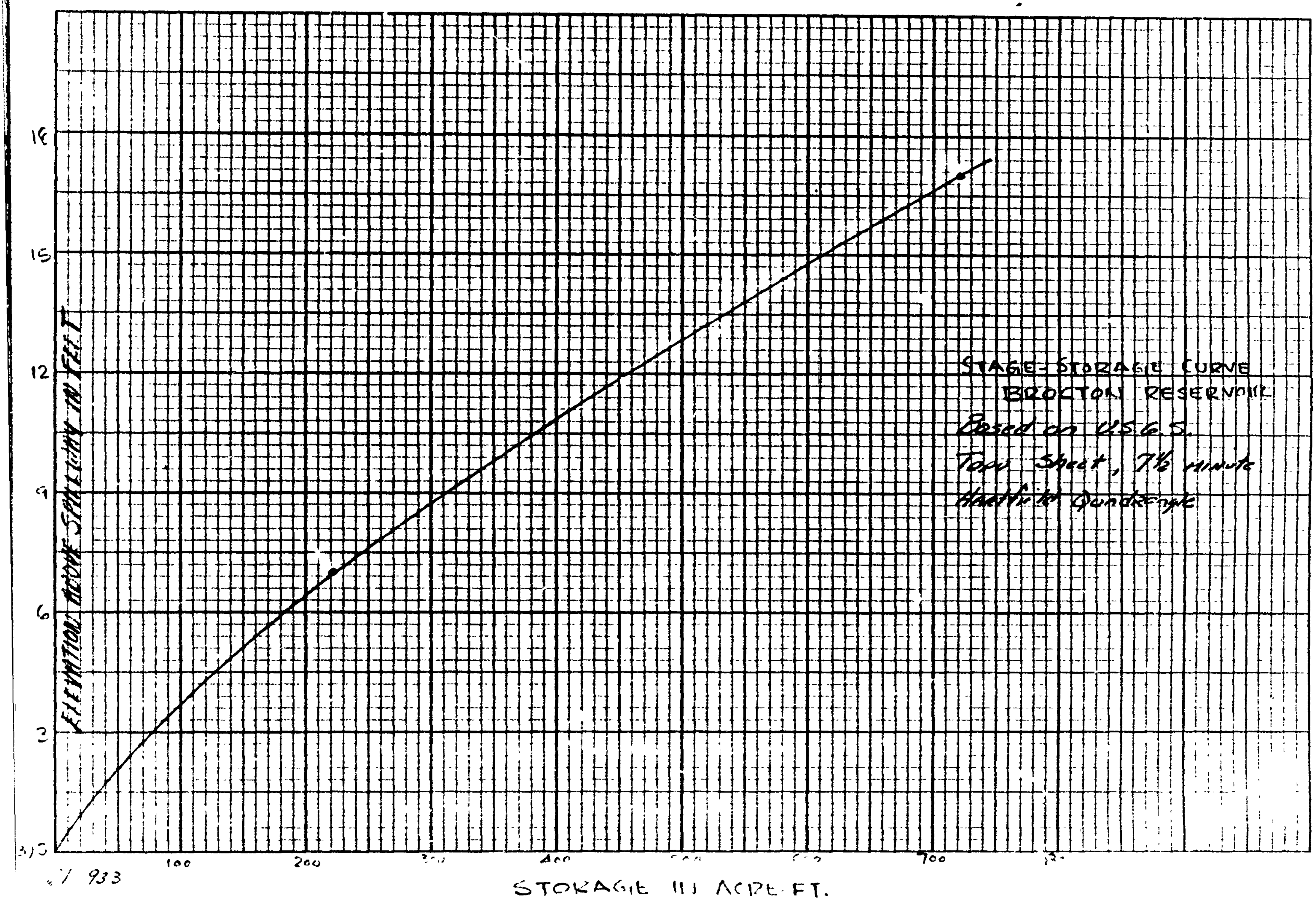
$Q = CLH^{3/2}$

ELEV.	H1	H2	$H_1^{3/2}$	$H_2^{3/2}$	L1	L2	Q1	Q2	TOTAL Q
933	0				60		0		0
934	1		1		60		194		194
935	2		2.83		60		576		576
936	3		5.20		60		1098		1098
937	4		8.0		60		1738		1738
938	5		11.18		60		2502		2502
939	6		14.70		60		3369		3369
940	7	0	18.52	0	60		4322		4322
941	8	1	22.63	1	60	223.5	5377	670	6047
942	9	2	27.0	2.83	60	223.5	6545	1897	8442

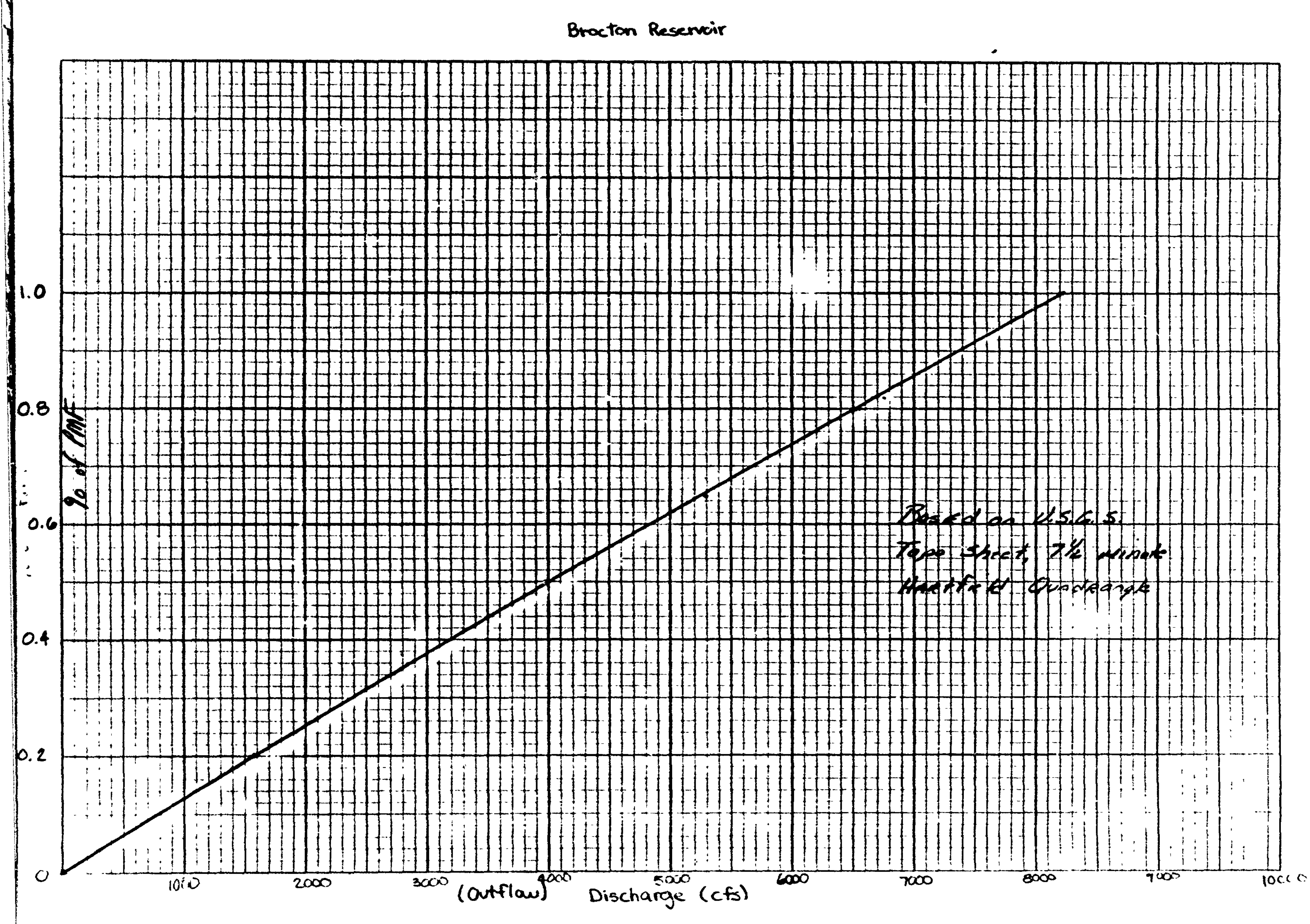
K•E 10 X 10 TO THE INCH • 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A. 46 0782



11933


STAGE-STORAGE CURVE
BROCTON RESERVOIR
Based on USGS
Topo Sheet, 7½ minute
Hartfield Quadrangle
ELEVATION ABOVE SPILLWAY IN FEET
18
15
12
9
6
3
100
200
400
700
STORAGE IN ACRE-FT.

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES KEUFFEL & ESSER CO MADE IN U.S.A. 46 0782



NOTE 3 USING STAGE-STORAGE DATA FROM USGS TOPO SHEET

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**************************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
LAST MODIFICATION  26 FEB 79
**************************************
  1   A1              ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
  2   A2              HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF NY785
  3   A3              RATIOS OF PMF ROUTED THROUGH THE RESERVOIR
  4   B     150      0     30      0      0      0      0      0      0      0
  5   B1      5
  6   J       1      5      1
  7   J1     .2    .35     .5    .65     .8      1
  8   K       0      1      0      0      0      0      1      0      0
  9   K1              CALCULATIONS OF INFLOW HYDROGRAPH
 10   M       1      1    3.5      0    3.5      0      0      0      0      0
 11   P       0   22.7    110    127    141
 12   T                                                1     .1
 13   W    2.50    .65
 14   X      -2    -.1      2
 15   K       1      2      0      0      0      0      1      0      0      0
 16   K1                     ROUTING OF INFLOW HYDROGRAPH
 17   Y       0      0      0      1      1
 18   Y1      1                                     -933     -1
 19   Y4    933    934    935    936    937    938    939    940    941    942
 20   Y5      0    194    576   1096   1736   2502   3369   4322   5377   6545
 21   $A      0     23     47     76    110    147    183    224    268    313
 22   $E    933    934    935    936    937    938    939    940    941    942
 23   $S    933
 24   $D    940    3.0    1.5  223.5
 25   A      99
```

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*******************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
*******************************

        TIME OF EXECUTION     15-JUL-80   15:20:08

                         ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
                         HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF NJ785
                         RATIOS OF PMF ROUTED THROUGH THE RESERVOIR

                                     JOB SPECIFICATION
          NQ      NHR     NMIN     IDAY      IHR     IMIN    METRC     IPLT     IPRT    NSTAN
         150        0       30        0        0        0        0        0        0        0
                                  JOPER      NWT    LROPT    TRACE
                                      5        0        0        0

                               MULTI-PLAN ANALYSES TO BE PERFORMED
                                  NPLAN= 1 NRTIO= 6 LRTIO= 1
               RTIOS=   0.20    0.35    0.50    0.65    0.80    1.00

     **********       **********       **********       **********       **********

                                  SUB-AREA RUNOFF COMPUTATION

                            CALCULATIONS OF INFLOW HYDROGRAPH

                    ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                        1        0        0        0        0        0        1        0        0

                                       HYDROGRAPH DATA
          IHYDG    IUHG    TAREA     SNAP    TRSDA    TRSPC    RATIO    ISNOW    ISAME    LOCAL
              1       1     3.50     0.00     3.50     0.00    0.000        0        0        0

                                         PRECIP DATA
                        SPFE     PMS      R6      R12      R24      R48      R72      R96
                        0.00   22.70  116.00   127.00   141.00     0.00     0.00     0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.800

                                          LOSS DATA
          LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
              0    0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.00

                                     UNIT HYDROGRAPH DATA
                               TP=  2.56      CP=0.63      NTA=  0

                                        RECESSION DATA
                           STRTQ=    -2.00     QRCSN=   -0.10     RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 4.61 AND R= 4.45 INTERVALS

             UNIT HYDROGRAPH 27 END-OF-PERIOD ORDINATES, LAG=   2.54 HOURS, CP= 0.63  VOL= 1.00
          44.      159.      311.      456.      548.      562.      493.      393.      314.      250.
         200.      159.      127.      101.       81.       65.       51.       41.       33.       26.
          21.       17.       13.       11.        8.        7.        5.

      0                              END-OF-PERIOD FLOW
```

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	0.30	1	0.08	0.00	0.08	7.
1.01	1.00	2	0.08	0.00	0.08	6.
1.01	1.30	3	0.08	0.00	0.08	6.
1.01	2.00	4	0.08	0.00	0.08	5.
1.01	2.30	5	0.08	0.00	0.08	5.
1.01	3.00	6	0.08	0.00	0.08	5.
1.01	3.30	7	0.08	0.00	0.08	4.
1.01	4.00	8	0.08	0.00	0.08	4.
1.01	4.30	9	0.08	0.00	0.08	4.
1.01	5.00	10	0.08	0.00	0.08	4.
1.01	5.30	11	0.08	0.00	0.08	3.
1.01	6.00	12	0.08	0.01	0.06	3.
1.01	6.30	13	0.17	0.12	0.05	9.
1.01	7.00	14	0.17	0.12	0.05	28.
1.01	7.30	15	0.17	0.12	0.05	65.
1.01	8.00	16	0.17	0.12	0.05	119.
1.01	8.30	17	0.17	0.12	0.05	193.
1.01	9.00	18	0.17	0.12	0.05	247.
1.01	9.30	19	0.17	0.12	0.05	304.
1.01	10.00	20	0.17	0.12	0.05	349.
1.01	10.30	21	0.17	0.12	0.05	395.
1.01	11.00	22	0.17	0.12	0.05	414.
1.01	11.30	23	0.17	0.12	0.05	437.
1.01	12.00	24	0.17	0.12	0.05	455.
1.01	12.30	25	1.05	1.00	0.05	508.
1.01	13.00	26	1.05	1.00	0.05	661.
1.01	13.30	27	1.26	1.21	0.05	955.
1.01	14.00	28	1.26	1.21	0.05	1399.
1.01	14.30	29	1.58	1.53	0.05	1970.
1.01	15.00	30	1.58	1.53	0.05	2619.
1.01	15.30	31	1.92	1.87	0.05	3288.
1.01	16.00	32	6.08	6.03	0.05	4139.
1.01	16.30	33	1.47	1.42	0.05	5262.
1.01	17.00	34	1.47	1.42	0.05	6462.
1.01	17.30	35	1.16	1.11	0.05	7500.
1.01	18.00	36	1.16	1.11	0.05	8141.
1.01	18.30	37	0.13	0.08	0.05	9234.
1.01	19.00	38	0.13	0.08	0.05	7725.
1.01	19.30	39	0.13	0.08	0.05	6856.
1.01	20.00	40	0.13	0.08	0.05	5927.
1.01	20.30	41	0.13	0.08	0.05	4973.
1.01	21.00	42	0.13	0.08	0.05	4083.
1.01	21.30	43	0.13	0.08	0.05	3327.
1.01	22.00	44	0.13	0.08	0.05	2725.
1.01	22.30	45	0.13	0.08	0.05	2244.
1.01	23.00	46	0.13	0.08	0.05	1860.
1.01	23.30	47	0.13	0.08	0.05	1554.
1.02	0.00	48	0.13	0.08	0.05	1310.
1.02	0.30	49	0.00	0.00	0.00	1111.
1.02	1.00	50	0.00	0.00	0.00	944.
1.02	1.30	51	0.00	0.00	0.00	813.
1.02	2.00	52	0.00	0.00	0.00	759.
1.02	2.30	53	0.00	0.00	0.00	708.
1.02	3.00	54	0.00	0.00	0.00	660.
1.02	3.30	55	0.00	0.00	0.00	616.
1.02	4.00	56	0.00	0.00	0.00	575.
1.02	4.30	57	0.00	0.00	0.00	536.
1.02	5.00	58	0.00	0.00	0.00	500.
1.02	5.30	59	0.00	0.00	0.00	467.

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.02	14.00	76	0.00	0.00	0.00	144.
1.02	14.30	77	0.00	0.00	0.00	134.
1.02	15.00	78	0.00	0.00	0.00	125.
1.02	15.30	79	0.00	0.00	0.00	117.
1.02	16.00	80	0.00	0.00	0.00	109.
1.02	16.30	81	0.00	0.00	0.00	102.
1.02	17.00	82	0.00	0.00	0.00	95.
1.02	17.30	83	0.00	0.00	0.00	88.
1.02	18.00	84	0.00	0.00	0.00	83.
1.02	18.30	85	0.00	0.00	0.00	77.
1.02	19.00	86	0.00	0.00	0.00	72.
1.02	19.30	87	0.00	0.00	0.00	67.
1.02	20.00	88	0.00	0.00	0.00	63.
1.02	20.30	89	0.00	0.00	0.00	58.
1.02	21.00	90	0.00	0.00	0.00	54.
1.02	21.30	91	0.00	0.00	0.00	51.
1.02	22.00	92	0.00	0.00	0.00	47.
1.02	22.30	93	0.00	0.00	0.00	44.
1.02	23.00	94	0.00	0.00	0.00	41.
1.02	23.30	95	0.00	0.00	0.00	39.
1.03	0.00	96	0.00	0.00	0.00	36.
1.03	0.30	97	0.00	0.00	0.00	34.
1.03	1.00	98	0.00	0.00	0.00	31.
1.03	1.30	99	0.00	0.00	0.00	29.
1.03	2.00	100	0.00	0.00	0.00	27.
1.03	2.30	101	0.00	0.00	0.00	25.
1.03	3.00	102	0.00	0.00	0.00	24.
1.03	3.30	103	0.00	0.00	0.00	22.
1.03	4.00	104	0.00	0.00	0.00	21.
1.03	4.30	105	0.00	0.00	0.00	19.
1.03	5.00	106	0.00	0.00	0.00	18.
1.03	5.30	107	0.00	0.00	0.00	17.
1.03	6.00	108	0.00	0.00	0.00	16.
1.03	6.30	109	0.00	0.00	0.00	15.
1.03	7.00	110	0.00	0.00	0.00	14.
1.03	7.30	111	0.00	0.00	0.00	13.
1.03	8.00	112	0.00	0.00	0.00	12.
1.03	8.30	113	0.00	0.00	0.00	11.
1.03	9.00	114	0.00	0.00	0.00	10.
1.03	9.30	115	0.00	0.00	0.00	10.
1.03	10.00	116	0.00	0.00	0.00	9.
1.03	10.30	117	0.00	0.00	0.00	8.
1.03	11.00	118	0.00	0.00	0.00	8.
1.03	11.30	119	0.00	0.00	0.00	7.
1.03	12.00	120	0.00	0.00	0.00	7.
1.03	12.30	121	0.00	0.00	0.00	6.
1.03	13.00	122	0.00	0.00	0.00	6.
1.03	13.30	123	0.00	0.00	0.00	6.
1.03	14.00	124	0.00	0.00	0.00	5.
1.03	14.30	125	0.00	0.00	0.00	5.
1.03	15.00	126	0.00	0.00	0.00	4.
1.03	15.30	127	0.00	0.00	0.00	4.
1.03	16.00	128	0.00	0.00	0.00	4.
1.03	16.30	129	0.00	0.00	0.00	4.
1.03	17.00	130	0.00	0.00	0.00	3.
1.03	17.30	131	0.00	0.00	0.00	3.
1.03	18.00	132	0.00	0.00	0.00	3.
1.03	18.30	133	0.00	0.00	0.00	3.
1.03	19.00	134	0.00	0.00	0.00	3.

1.02	6.00	60	0.00	0.00	0.00	436.	1.03	19.30	135	0.00	0.00	0.00	2.
1.02	6.30	61	0.00	0.00	0.00	407.	1.03	20.00	136	0.00	0.00	0.00	2.
1.02	7.00	62	0.00	0.00	0.00	379.	1.03	20.30	137	0.00	0.00	0.00	2.
1.02	7.30	63	0.00	0.00	0.00	354.	1.03	21.00	138	0.00	0.00	0.00	2.
1.02	8.00	64	0.00	0.00	0.00	330.	1.03	21.30	139	0.00	0.00	0.00	2.
1.02	8.30	65	0.00	0.00	0.00	308.	1.03	22.00	140	0.00	0.00	0.00	2.
1.02	9.00	66	0.00	0.00	0.00	287.	1.03	22.30	141	0.00	0.00	0.00	2.
1.02	9.30	67	0.00	0.00	0.00	268.	1.03	23.00	142	0.00	0.00	0.00	1.
1.02	10.00	68	0.00	0.00	0.00	250.	1.03	23.30	143	0.00	0.00	0.00	1.
1.02	10.30	69	0.00	0.00	0.00	233.	1.04	0.00	144	0.00	0.00	0.00	1.
1.02	11.00	70	0.00	0.00	0.00	218.	1.04	0.30	145	0.00	0.00	0.00	1.
1.02	11.30	71	0.00	0.00	0.00	203.	1.04	1.00	146	0.00	0.00	0.00	1.
1.02	12.00	72	0.00	0.00	0.00	190.	1.04	1.30	147	0.00	0.00	0.00	1.
1.02	12.30	73	0.00	0.00	0.00	177.	1.04	2.00	148	0.00	0.00	0.00	1.
1.02	13.00	74	0.00	0.00	0.00	165.	1.04	2.30	149	0.00	0.00	0.00	1.
1.02	13.30	75	0.00	0.00	0.00	154.	1.04	3.00	150	0.00	0.00	0.00	1.

SUM 25.61 22.80 2.81 110966.
(650.)(579.)(71.)(3142.21)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8234.	6052.	2213.	771.	110962.
CMS	233.	171.	63.	22.	3142.
INCHES		16.06	23.53	24.58	24.58
MM		408.53	597.72	624.21	624.24
AC-FT		3001.	4390.	4585.	4585.
THOUS CU M		3701.	5415.	5656.	5656.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	2.	6.	13.	24.	37.	49.	61.	70.
77.	83.	87.	91.	102.	132.	191.	280.	394.	524.
650.	828.	1052.	1292.	1500.	1628.	1647.	1545.	1373.	1185.
995.	817.	665.	545.	449.	372.	311.	262.	222.	189.
163.	152.	142.	132.	123.	115.	107.	100.	93.	87.
81.	76.	71.	66.	62.	57.	54.	50.	47.	44.
41.	38.	35.	33.	31.	29.	27.	25.	23.	22.
20.	19.	18.	17.	15.	14.	13.	13.	12.	11.
10.	9.	9.	8.	8.	7.	7.	6.	6.	5.
5.	5.	4.	4.	4.	4.	3.	3.	3.	3.
3.	2.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1647.	1210.	443.	154.	22192.
CMS	47.	34.	13.	4.	628.
INCHES		3.22	4.71	4.92	4.92
MM		81.71	119.54	124.84	124.85
AC-FT		600.	878.	917.	917.
THOUS CU M		740.	1083.	1131.	1131.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

2.	2.	2.	2.	2.	2.	2.	1.	1.	1.
1.	1.	3.	10.	23.	42.	64.	87.	106.	122.
135.	145.	153.	159.	176.	231.	334.	490.	690.	917.

1151.	1449.	1542.	2262.	2625.	2849.	2882.	2704.	2403.	2074.
1740.	1429.	1165.	954.	735.	651.	544.	458.	389.	330.
265.	250.	240.	231.	216.	201.	188.	175.	163.	152.
142.	133.	124.	116.	108.	101.	94.	88.	82.	76.
71.	66.	62.	58.	54.	50.	47.	44.	41.	38.
36.	33.	31.	29.	27.	25.	23.	22.	20.	19.
18.	17.	15.	14.	13.	13.	12.	11.	10.	10.
9.	8.	8.	7.	7.	6.	6.	5.	5.	5.
4.	4.	4.	4.	3.	3.	3.	3.	3.	2.
2.	2.	2.	2.	2.	2.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2882.	2118.	775.	270.	38837.
CMS	82.	60.	22.	8.	1100.
INCHES		5.63	8.24	8.60	8.60
MM		142.99	209.20	218.47	218.48
AC-FT		1050.	1537.	1605.	1605.
THOUS CU M		1295.	1895.	1979.	1980.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

3.	3.	3.	3.	2.	2.	2.	2.	2.	2.
2.	2.	5.	14.	33.	59.	91.	124.	152.	175.
193.	207.	216.	227.	254.	330.	477.	700.	965.	1310.
1644.	2069.	2631.	3231.	3750.	4070.	4117.	3863.	3433.	2963.
2466.	2042.	1564.	1362.	1122.	930.	777.	655.	556.	472.
407.	379.	354.	330.	308.	287.	268.	250.	233.	218.
203.	190.	177.	165.	154.	144.	134.	125.	117.	109.
102.	95.	88.	83.	77.	72.	67.	63.	58.	54.
51.	47.	44.	41.	39.	36.	34.	31.	29.	27.
25.	24.	22.	21.	19.	18.	17.	16.	15.	14.
13.	12.	11.	10.	10.	9.	8.	8.	7.	7.
6.	6.	6.	5.	5.	4.	4.	4.	4.	3.
3.	3.	3.	3.	2.	2.	2.	2.	2.	2.
2.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4117.	3026.	1107.	385.	55481.
CMS	117.	86.	31.	11.	1571.
INCHES		8.04	11.77	12.29	12.29
MM		204.27	298.86	312.11	312.12
AC-FT		1500.	2195.	2293.	2293.
THOUS CU M		1851.	2708.	2828.	2828.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

4.	4.	4.	3.	3.	3.	3.	3.	2.	2.
2.	2.	6.	18.	43.	77.	119.	161.	198.	227.
250.	269.	284.	296.	330.	429.	621.	910.	1261.	1703.
2138.	2690.	3420.	4200.	4875.	5292.	5352.	5021.	4463.	3852.
3232.	2654.	2163.	1771.	1456.	1209.	1010.	851.	722.	613.
528.	493.	460.	429.	401.	374.	349.	325.	304.	283.
264.	247.	230.	215.	200.	187.	174.	163.	152.	142.
132.	123.	115.	107.	100.	93.	87.	81.	76.	71.
66.	62.	58.	54.	50.	47.	44.	41.	38.	35.
33.	31.	29.	27.	25.	23.	22.	20.	19.	18.

17.	15.	14.	13.	13.	12.	11.	10.	9.	9.
6.	6.	7.	7.	6.	6.	5.	5.	5.	4.
4.	4.	4.	3.	3.	3.	3.	3.	2.	2.
2.	2.	2.	2.	2.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5352.	3934.	1439.	501.	72126.
CMS	152.	111.	41.	14.	2042.
INCHES		10.45	15.30	15.97	15.97
MM		265.54	388.52	405.74	405.76
AC-FT		1951.	2854.	2980.	2980.
THOUS CU M		2406.	3520.	3676.	3676.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

5.	5.	5.	4.	4.	4.	3.	3.	3.	3.
3.	3.	7.	23.	52.	95.	146.	198.	243.	279.
306.	331.	349.	364.	407.	529.	764.	1120.	1576.	2096.
2631.	3311.	4269.	5169.	6000.	6513.	6567.	6180.	5493.	4741.
3975.	3267.	2562.	2160.	1795.	1488.	1243.	1048.	869.	755.
650.	607.	566.	526.	493.	460.	429.	400.	374.	349.
325.	303.	283.	264.	246.	230.	215.	200.	187.	174.
163.	152.	142.	132.	123.	115.	107.	100.	93.	87.
81.	76.	71.	66.	62.	57.	54.	50.	47.	44.
41.	38.	35.	33.	31.	29.	27.	25.	23.	22.
20.	19.	18.	17.	15.	14.	13.	13.	12.	11.
10.	9.	9.	8.	8.	7.	7.	6.	6.	5.
5.	5.	4.	4.	4.	4.	3.	3.	3.	3.
3.	2.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6567.	4841.	1771.	616.	88770.
CMS	187.	137.	50.	17.	2514.
INCHES		12.87	18.83	19.66	19.66
MM		326.82	478.17	499.37	499.39
AC-FT		2401.	3512.	3668.	3668.
THOUS CU M		2961.	4332.	4524.	4525.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

7.	6.	6.	5.	5.	5.	4.	4.	4.	4.
3.	3.	9.	28.	65.	119.	183.	247.	304.	349.
365.	414.	437.	455.	508.	661.	955.	1399.	1970.	2619.
3288.	4139.	5262.	6462.	7500.	8141.	6234.	7725.	6866.	5927.
4973.	4083.	3327.	2725.	2244.	1860.	1554.	1310.	1111.	944.
813.	759.	708.	660.	616.	575.	536.	500.	467.	436.
407.	379.	354.	330.	308.	287.	268.	250.	233.	218.
203.	190.	177.	165.	154.	144.	134.	125.	117.	109.
102.	95.	88.	83.	77.	72.	67.	63.	58.	54.
51.	47.	44.	41.	39.	36.	34.	31.	29.	27.
25.	24.	22.	21.	19.	18.	17.	16.	15.	14.
13.	12.	11.	10.	10.	9.	8.	8.	7.	7.
6.	6.	6.	5.	5.	4.	4.	4.	4.	3.
3.	3.	3.	3.	2.	2.	2.	2.	2.	2.
2.	1.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME

CFS	8234.	5052.	2213.	771.	110962.
CMS	233.	171.	63.	22.	3142.
INCHES		16.08	23.53	24.50	24.56
MM		408.53	597.72	624.21	624.24
AC-FT		3001.	4390.	4565.	4565.
THOUS CU M		3701.	5415.	5630.	5630.

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HYDROGRAPH ROUTING

ROUTING OF INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP		LSTR
0.0	0.000	0.00	1	1	0	0		0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-933.	-1

STAGE	933.00	934.00	935.00	936.00	937.00	938.00	939.00	940.00	941.00	942.00
FLOW	0.00	194.00	576.00	1098.00	1738.00	2502.00	3369.00	4322.00	5377.00	6545.00
CAPACITY=	0.	20.	47.	78.	110.	147.	183.	224.	268.	313.
ELEVATION=	933.	934.	935.	936.	937.	938.	939.	940.	941.	942.

CREL	SPWID	COQW	EXPW	ELEVL	COOL	CAREA	EXPL
933.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
943.0	3.0	1.5	223.

STATION 2, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	2.	4.	9.	16.	25.	35.	45.
54.	63.	70.	76.	83.	94.	117.	156.	225.	331.
448.	583.	707.	975.	1206.	1415.	1545.	1575.	1507.	1374.
1206.	1039.	865.	741.	615.	516.	436.	369.	312.	264.
224.	194.	176.	164.	152.	141.	131.	122.	114.	106.
99.	92.	86.	80.	75.	70.	65.	61.	57.	53.
49.	46.	43.	40.	37.	35.	32.	30.	28.	26.
25.	23.	21.	20.	19.	17.	16.	15.	14.	13.
12.	11.	11.	10.	9.	9.	8.	8.	7.	7.
6.	5.	5.	5.	5.	4.	4.	4.	4.	3.
3.	3.	3.	2.	2.	2.	2.	2.	2.	2.
2.	1.	1.	1.	1.	1.	1.	1.	1.	1.

1.	1.	1.	1.	1.	1.	1.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	1.	2.	3.	4.	5.
6.	6.	7.	8.	9.	10.	12.	16.	22.	30.
38.	47.	58.	71.	83.	94.	100.	102.	98.	92.
83.	74.	65.	57.	49.	43.	37.	32.	28.	25.
22.	20.	18.	17.	16.	15.	14.	13.	12.	11.
10.	9.	9.	8.	8.	7.	7.	6.	6.	5.
5.	5.	4.	4.	4.	4.	3.	3.	3.	3.
3.	2.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STAGE

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.1	933.1	933.2	933.2
933.3	933.3	933.4	933.4	933.4	933.5	933.6	933.8	934.1	934.4
934.7	935.0	935.4	935.8	936.2	936.5	936.7	936.7	936.6	936.4
936.2	935.9	935.6	935.3	935.1	934.8	934.6	934.5	934.3	934.2
934.1	934.0	933.9	933.8	933.8	933.7	933.7	933.6	933.6	933.5
933.5	933.5	933.4	933.4	933.4	933.4	933.3	933.3	933.3	933.3
933.3	933.2	933.2	933.2	933.2	933.2	933.2	933.2	933.1	933.1
933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1
933.1	933.1	933.1	933.1	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0

PEAK OUTFLOW IS 1575. AT TIME 19.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1575.	1160.	442.	154.	22195.
CMS	45.	33.	13.	4.	628.
INCHES		3.14	4.70	4.92	4.92
MM		79.67	119.30	124.85	124.86
AC-FT		585.	876.	917.	917.
THOUS CU M		722.	1081.	1131.	1131.

STATION 2, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1.	1.	2.	2.	2.	2.	2.	2.	2.	1.
1.	1.	2.	3.	8.	16.	28.	44.	61.	79.
98.	110.	123.	134.	146.	165.	206.	300.	431.	603.
825.	1070.	1403.	1783.	2178.	2513.	2747.	2778.	2629.	2383.
2098.	1791.	1501.	1243.	1033.	870.	730.	612.	522.	449.
385.	335.	300.	272.	250.	231.	215.	200.	188.	178.

166.	155.	146.	138.	130.	121.	113.	106.	99.	92.
86.	80.	75.	70.	65.	61.	57.	53.	50.	46.
43.	40.	38.	35.	33.	30.	28.	27.	25.	23.
22.	20.	19.	17.	16.	15.	14.	13.	12.	12.
11.	10.	9.	9.	8.	8.	7.	7.	6.	6.
5.	5.	5.	4.	4.	4.	4.	3.	3.	3.
3.	3.	2.	2.	2.	2.	2.	2.	2.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	0.	0.	0.	0.	0.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	1.	2.	3.	5.	6.	8.
10.	11.	13.	14.	15.	17.	21.	28.	37.	49.
62.	76.	93.	112.	131.	147.	157.	158.	152.	141.
127.	113.	98.	85.	74.	64.	56.	49.	43.	38.
33.	30.	27.	26.	24.	23.	21.	20.	19.	18.
17.	16.	15.	14.	13.	12.	12.	11.	10.	9.
9.	8.	8.	7.	7.	6.	6.	5.	5.	5.
4.	4.	4.	4.	3.	3.	3.	3.	3.	2.
2.	2.	2.	2.	2.	2.	[illegible]	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STAGE

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.1	933.1	933.2	933.3	933.4
933.5	933.5	933.6	933.7	933.8	933.9	934.0	934.3	934.6	935.1
935.5	935.9	936.5	937.1	937.6	938.0	938.3	938.3	938.1	937.8
937.5	937.1	936.6	936.2	935.9	935.6	935.3	935.1	934.9	934.7
934.5	934.4	934.3	934.2	934.1	934.1	934.1	934.0	934.0	933.9
933.9	933.8	933.8	933.7	933.7	933.6	933.6	933.5	933.5	933.5
933.4	933.4	933.4	933.4	933.3	933.3	933.3	933.3	933.3	933.2
933.2	933.2	933.2	933.2	933.2	933.2	933.1	933.1	933.1	933.1
933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1
933.1	933.1	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0

PEAK OUTFLOW IS 2778. AT TIME 19.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2778.	2090.	773.	270.	38841.
CMS	79.	59.	22.	8.	1100.
INCHES		5.53	8.22	8.60	8.60
MM		140.42	208.78	218.50	218.51
AC-FT		1031.	1534.	1605.	1605.
THOUS CU M		1272.	1892.	1980.	1980.

STATION 2, PLAN 1, RATIO 3

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	5.	11.	23.	40.	63.	88.	113.
137.	158.	176.	192.	213.	249.	319.	441.	629.	897.
1209.	1566.	2040.	2581.	3185.	3660.	3941.	3972.	3762.	3396.
2951.	2495.	2111.	1753.	1454.	1204.	1010.	858.	728.	617.
532.	469.	423.	380.	356.	330.	305.	285.	266.	248.
231.	215.	201.	189.	179.	169.	159.	149.	140.	131.
122.	114.	107.	100.	93.	87.	81.	76.	71.	66.
62.	58.	54.	50.	47.	44.	41.	38.	35.	33.
31.	29.	27.	25.	23.	22.	20.	19.	18.	16.
15.	14.	13.	12.	12.	11.	10.	9.	9.	8.
8.	7.	7.	6.	6.	5.	5.	5.	4.	4.
4.	4.	3.	3.	3.	3.	3.	2.	2.	2.
2.	2.	2.	2.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	[illegible]	1.	2.	4.	6.	9.	12.
14.	16.	16.	20.	21.	24.	29.	37.	50.	66.
64.	102.	125.	150.	175.	190.	208.	209.	200.	184.
160.	147.	126.	111.	96.	83.	73.	64.	56.	49.
44.	39.	36.	34.	31.	30.	28.	26.	25.	24.
23.	22.	20.	19.	18.	17.	16.	15.	14.	13.
13.	12.	11.	10.	10.	9.	8.	8.	7.	7.
6.	6.	6.	5.	5.	4.	4.	4.	4.	3.
3.	3.	3.	3.	2.	2.	2.	2.	2.	2.
2.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	[illegible]	0.	0.	0.	0.	0.	0.

STAGE

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.1	933.1	933.2	933.3	933.5	933.6
933.7	933.8	933.9	934.0	934.0	934.1	934.3	934.6	935.1	935.6
936.2	936.6	937.4	938.1	938.8	939.3	939.6	939.6	939.4	939.0
936.5	936.0	937.5	937.0	936.6	936.2	935.8	935.5	935.3	935.1
934.9	934.7	934.6	934.5	934.5	934.4	934.3	934.2	934.2	934.1
934.1	934.1	933.6	934.0	933.9	933.9	933.8	933.8	933.7	933.7
933.6	933.6	933.5	933.5	933.5	933.4	933.4	933.4	933.4	933.3
933.3	933.3	933.3	933.3	933.2	933.2	933.2	933.2	933.2	933.2
933.2	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1
933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.	933.0	933.0	933.0	933.0	933.0	933.0	933.0

PEAK OUTFLOW IS 3972. AT TIME 19.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3972.	2960.	1105.	385.	55466.
CMS	112.	84.	31.	11.	1571.
INCHES		7.92	11.74	12.29	12.29
MM		201.20	298.27	312.13	312.15
AC-FT		1470.	2191.	2293.	2293.
THOUS CU M		1823.	2702.	2828.	2828.

STATION 2, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1.	2.	3.	3.	3.	3.	3.	3.	3.	3.
2.	2.	3.	6.	[illegible]	29.	52.	82.	114.	147.
178.	209.	239.	262.	285.	328.	417.	575.	843.	1189.
1610.	2091.	2686.	3431.	4149.	4866.	5278.	5194.	4790.	4289.
3904.	3243.	2668.	2238.	1865.	1552.	1293.	1083.	930.	795.
679.	592.	536.	496.	459.	427.	397.	370.	345.	322.
[illegible]	280.	261.	244.	227.	212.	198.	187.	177.	167.
157.	147.	136.	129.	120.	113.	105.	98.	92.	86.
80.	75.	70.	65.	61.	57.	53.	49.	46.	43.
40.	37.	35.	33.	30.	28.	26.	25.	23.	21.
20.	19.	17.	16.	15.	14.	13.	12.	11.	11.
10.	9.	9.	8.	8.	7.	7.	6.	6.	5.
5.	5.	[illegible]	4.	4.	4.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	3.	5.	6.	12.	15.
18.	21.	23.	25.	26.	29.	36.	47.	63.	83.
154.	127.	155.	186.	217.	240.	251.	249.	238.	223.
202.	178.	155.	134.	116.	101.	88.	77.	68.	60.
53.	46.	44.	41.	39.	36.	34.	32.	31.	29.
27.	26.	25.	24.	22.	21.	20.	19.	18.	17.
16.	15.	14.	13.	12.	12.	11.	10.	9.	9.
8.	8.	7.	7.	6.	6.	5.	5.	5.	4.
4.	4.	4.	3.	3.	3.	3.	3.	2.	2.
2.	2.	2.	2.	2.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STAGE

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.1	933.2	933.3	933.4	933.6	933.8
933.9	934.0	934.1	934.2	934.2	934.4	934.6	935.0	935.5	936.1
936.8	937.5	938.2	939.1	939.8	940.4	940.6	940.6	940.3	940.0
939.5	938.9	938.2	937.7	937.2	936.7	936.3	936.0	935.7	935.4
935.2	935.0	934.9	934.8	934.7	934.6	934.5	934.5	934.4	934.3
934.3	934.2	934.2	934.1	934.1	934.0	934.0	934.0	933.9	933.9
933.8	933.8	933.7	933.7	933.6	933.6	933.5	933.5	933.5	933.4
933.4	933.4	933.4	933.3	933.3	933.3	933.3	933.3	933.2	933.2
933.2	933.2	933.2	933.2	933.2	933.1	933.1	933.1	933.1	933.1
933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1
933.1	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0

PEAK OUTFLOW IS 5278. AT TIME 13.50 HOURS

STATION 2, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1.	2.	3.	3.	3.	3.	3.	3.	3.	3.
2.	2.	3.	6.	[illegible]	24.	52.	82.	114.	147.
176.	209.	239.	262.	285.	328.	417.	575.	843.	1189.
1610.	2091.	2686.	3431.	4149.	4866.	5278.	5194.	4790.	4289.
3904.	3243.	2688.	2238.	1865.	1552.	1293.	1083.	930.	795.
879.	592.	536.	496.	459.	427.	397.	370.	345.	322.
[illegible]	280.	261.	244.	227.	212.	198.	187.	177.	167.
157.	147.	136.	129.	120.	113.	105.	98.	92.	86.
80.	75.	70.	65.	61.	57.	53.	49.	46.	43.
40.	37.	35.	33.	30.	28.	26.	25.	23.	21.
20.	19.	17.	16.	15.	14.	13.	12.	11.	11.
10.	9.	9.	8.	8.	7.	7.	6.	6.	5.
5.	5.	[illegible]	4.	4.	4.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	3.	5.	8.	12.	15.
16.	21.	23.	25.	26.	29.	36.	47.	63.	83.
[illegible]	127.	155.	186.	217.	240.	251.	249.	238.	223.
[illegible]	176.	155.	134.	116.	101.	88.	77.	68.	60.
53.	48.	44.	41.	39.	36.	34.	32.	31.	29.
27.	26.	25.	24.	22.	21.	20.	19.	18.	17.
16.	15.	14.	13.	12.	12.	11.	10.	9.	9.
8.	8.	7.	7.	6.	6.	5.	5.	5.	4.
4.	4.	4.	3.	3.	3.	3.	3.	2.	2.
2.	2.	2.	2.	2.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STAGE

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.1	933.2	933.3	933.4	933.6	933.8
933.9	934.0	934.1	934.2	934.2	934.4	934.6	935.0	935.5	936.1
936.8	937.5	938.2	939.1	939.8	940.4	940.6	940.6	940.3	940.0
939.5	938.9	938.2	937.7	937.2	936.7	936.3	936.0	935.7	935.4
935.2	935.0	934.9	934.8	934.7	934.6	934.5	934.5	934.4	934.3
934.3	934.2	934.2	934.1	934.1	934.0	934.0	934.0	933.9	933.9
933.8	933.8	933.7	933.7	933.6	933.6	933.5	933.5	933.5	933.4
933.4	933.4	933.4	933.3	933.3	933.3	933.3	933.3	933.2	933.2
933.2	933.2	933.2	933.2	933.2	933.1	933.1	933.1	933.1	933.1
933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1
933.1	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0

EAK OUTFLOW IS 5278. AT TIME 11.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5276.	3882.	1436.	501.	72132.
CMS	149.	110.	41.	14.	2043.
INCHES		10.32	15.27	15.98	15.98
MM		262.06	387.82	405.77	405.79
AC-FT		1925.	2849.	2980.	2981.
THOUS CU M		2374.	3514.	3676.	3677.

STATION 2, PLAN 1, RATIO 5

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

2.	3.	3.	4.	4.	4.	4.	4.	3.	3.
3.	3.	4.	7.	17.	36.	64.	100.	141.	181.
227.	269.	301.	326.	353.	405.	514.	726.	1047.	1502.
2011.	2595.	3369.	4226.	5356.	6228.	6555.	6381.	5839.	5158.
4469.	3900.	3291.	2713.	2258.	1889.	1580.	1326.	1117.	962.
828.	725.	654.	599.	556.	520.	486.	454.	424.	395.
369.	344.	321.	300.	280.	261.	243.	227.	212.	198.
187.	177.	167.	157.	147.	138.	129.	120.	113.	105.
98.	92.	86.	80.	75.	70.	65.	61.	57.	53.
49.	46.	43.	40.	37.	35.	32.	30.	28.	26.
25.	23.	21.	20.	19.	17.	16.	15.	14.	13.
12.	11.	11.	10.	9.	9.	8.	8.	7.	7.
6.	6.	5.	5.	5.	4.	4.	4.	4.	3.
3.	3.	3.	2.	2.	2.	2.	2.	2.	2.
2.	1.	1.	1.	1.	1.	1.	1.	1.	1.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	2.	4.	7.	10.	14.	19.
22.	25.	26.	29.	31.	35.	43.	56.	75.	98.
123.	151.	163.	220.	253.	272.	276.	275.	264.	248.
229.	206.	180.	156.	135.	117.	102.	89.	79.	70.
62.	56.	52.	48.	46.	43.	41.	38.	36.	34.
32.	31.	29.	27.	26.	25.	23.	22.	21.	20.
19.	18.	17.	16.	15.	14.	13.	12.	12.	11.
10.	9.	9.	8.	8.	7.	7.	6.	6.	5.
5.	5.	4.	4.	4.	4.	3.	3.	3.	3.
3.	2.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STAGE

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.1	933.2	933.3	933.5	933.7	933.9
934.1	934.2	934.3	934.3	934.4	934.6	934.8	935.3	935.9	936.6
937.4	938.1	939.0	939.9	940.7	941.1	941.2	941.2	940.9	940.5
940.1	939.6	938.9	938.2	937.7	937.2	936.8	936.4	936.0	935.7
935.5	935.3	935.1	935.0	934.9	934.9	934.8	934.7	934.6	934.5
934.5	934.4	934.3	934.3	934.2	934.2	934.1	934.1	934.0	934.0
934.0	933.9	933.9	933.8	933.8	933.7	933.7	933.6	933.6	933.5
933.5	933.5	933.4	933.4	933.4	933.4	933.3	933.3	933.3	933.3
933.3	933.2	933.2	933.2	933.2	933.2	933.2	933.2	933.1	933.1
933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1
933.1	933.1	933.1	933.1	933.0	933.0	933.0	933.0	933.0	933.0

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0

PEAK OUTFLOW IS 6555. AT TIME 16.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6555.	4766.	1766.	616.	88776.
CMS	186.	135.	50.	17.	2514.
INCHES		12.72	18.80	19.66	19.66
MM		323.06	477.46	499.40	499.43
AC-FT		2373.	3507.	3668.	3668.
THOUS CU M		2927.	4326.	4525.	4525.

STATION 2, PLAN 1, RATIO 6

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

2.	4.	4.	5.	5.	5.	5.	5.	4.	4.
4.	4.	5.	9.	22.	45.	81.	125.	176.	237.
296.	343.	380.	410.	442.	507.	652.	923.	1345.	1904.
2535.	3316.	4216.	5615.	6986.	7867.	8211.	7962.	7254.	6368.
5469.	4625.	3976.	3300.	2778.	2316.	1952.	1643.	1390.	1178.
1014.	890.	812.	746.	690.	641.	597.	559.	525.	492.
460.	430.	401.	374.	349.	326.	304.	284.	265.	247.
231.	215.	201.	189.	179.	169.	159.	149.	140.	131.
122.	114.	107.	100.	93.	87.	81.	76.	71.	66.
62.	58.	54.	50.	47.	44.	41.	38.	35.	33.
31.	29.	27.	25.	23.	22.	20.	19.	18.	16.
15.	14.	13.	12.	12.	11.	10.	9.	9.	8.
8.	7.	7.	6.	6.	5.	5.	5.	4.	4.
4.	4.	3.	3.	3.	3.	3.	2.	2.	2.
2.	2.	2.	2.	1.	1.	1.	1.	1.	1.

STORAGE

0.	0.	0.	0.	1.	0.	0.	0.	0.	0.
0.	0.	0.	1.	2.	5.	8.	13.	18.	23.
27.	31.	33.	35.	38.	42.	52.	68.	90.	118.
146.	181.	219.	259.	287.	303.	309.	305.	292.	275.
255.	234.	209.	183.	158.	138.	120.	105.	93.	82.
73.	66.	61.	57.	54.	51.	48.	46.	43.	41.
39.	37.	35.	33.	31.	29.	26.	26.	25.	24.
23.	21.	20.	19.	18.	17.	16.	15.	14.	13.
13.	12.	11.	10.	10.	9.	8.	8.	7.	7.
6.	6.	6.	5.	5.	4.	4.	4.	4.	3.
3.	3.	3.	3.	2.	2.	2.	2.	2.	2.
2.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STAGE

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.1	933.2	933.4	933.6	933.9	934.1
934.3	934.4	934.5	934.6	934.6	934.8	935.1	935.7	936.4	937.2
938.0	938.9	939.9	940.8	941.4	941.6	941.9	941.8	941.5	941.1
940.7	940.2	939.5	939.0	938.3	937.8	937.3	936.9	936.5	936.1

935.8	935.6	935.5	935.3	935.2	935.1	935.0	935.0	934.9	934.8
934.7	934.6	934.5	934.5	934.4	934.3	934.3	934.2	934.2	934.1
934.1	934.1	934.0	934.0	933.9	933.9	933.8	933.8	933.7	933.7
933.6	933.6	933.5	933.5	933.5	933.4	933.4	933.4	933.4	933.3
933.3	933.3	933.3	933.3	933.2	933.2	933.2	933.2	933.2	933.2
933.2	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1
933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0

PEAK OUTFLOW IS 8211. AT TIME 18.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8211.	5991.	2211.	771.	110969.
CMS	233.	170.	63.	22.	3142.
INCHES		15.92	23.50	24.58	24.58
MM		404.43	596.94	624.24	624.28
AC-FT		2971.	4385.	4585.	4586.
THOUS CU M		3664.	5408.	5656.	5656.

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 0.20	RATIO 2 0.35	RATIO 3 0.50	RATIO 4 0.65	RATIO 5 0.80	RATIO 6 1.00
				RATIOS APPLIED TO FLOWS					
HYDROGRAPH AT	1	3.50	1	1647.	2882.	4117.	5352.	6587.	8234.
	(	9.06)	(	46.63)(	81.61)(	116.58)(	151.56)(	186.53)(	233.17)(
ROUTED TO	2	3.50	1	1575.	2778.	3972.	5278.	6555.	8211.
	(	9.05)	(	44.59)(	78.65)(	112.48)(	149.45)(	185.62)(	232.52)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	933.00	933.00	940.00
STORAGE	0.	0.	224.
OUTFLOW	0.	0.	4322.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.20	936.74	0.00	102.	1575.	0.00	19.00	0.00
0.35	938.32	0.00	158.	2778.	0.00	19.00	0.00
0.50	939.63	0.00	209.	3972.	0.00	19.00	0.00
0.65	940.61	0.61	251.	5278.	2.00	18.50	0.00
0.80	941.23	1.23	278.	6555.	3.50	18.50	0.00
1.00	941.91	1.91	309.	8211.	4.50	18.50	0.00

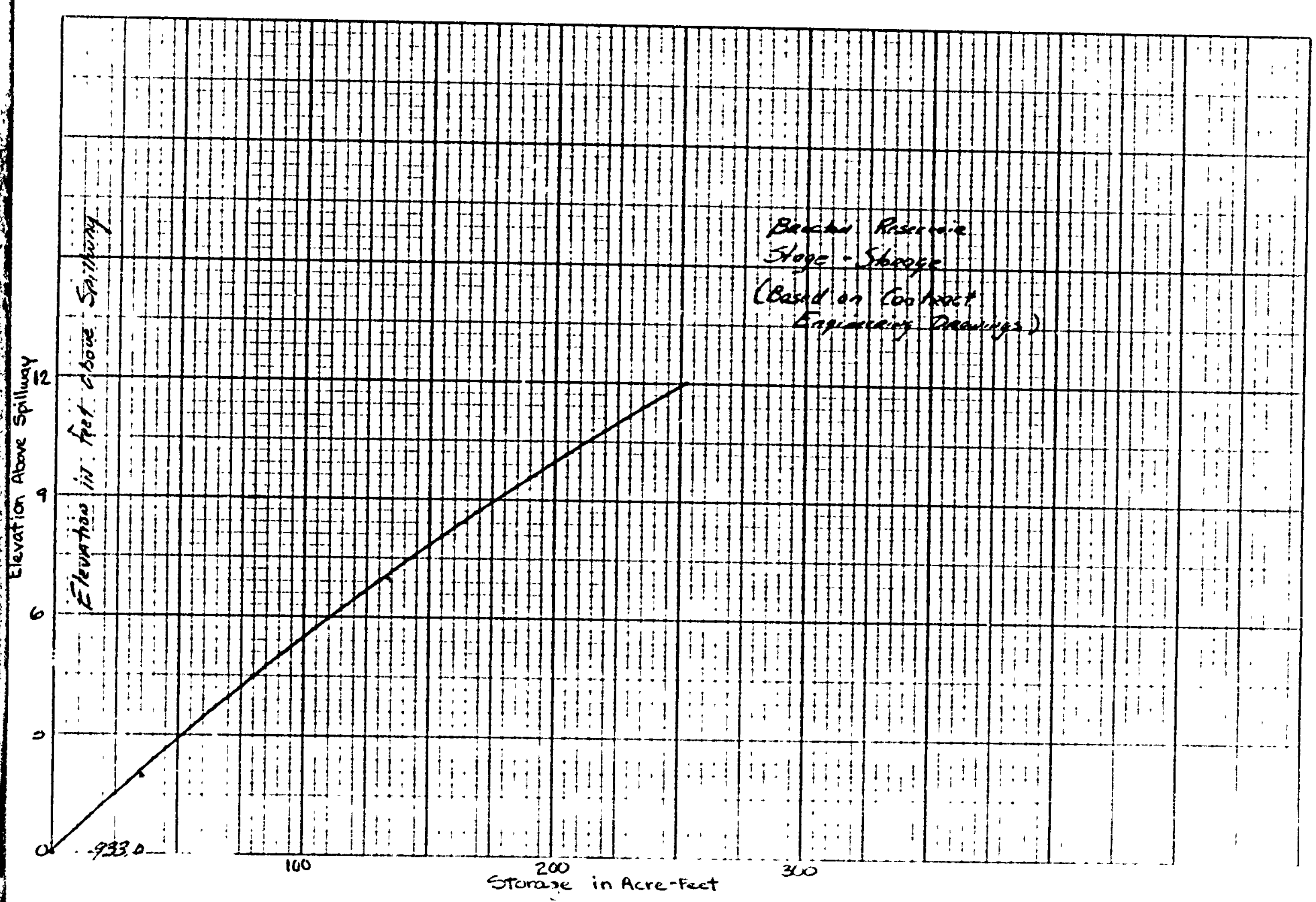
McFarland-Johnson Engineers, Inc.
171 Front Street
BINGHAMTON, NEW YORK 13905

JOB Hydrologic Study Dam # NY 785
SHEET NO ______ OF ______
CALCULATED BY R. Weidt DATE ______
CHECKED BY ______ DATE ______
SCALE ______

Stage - Storage (Based on Contract Eng. Drawings)

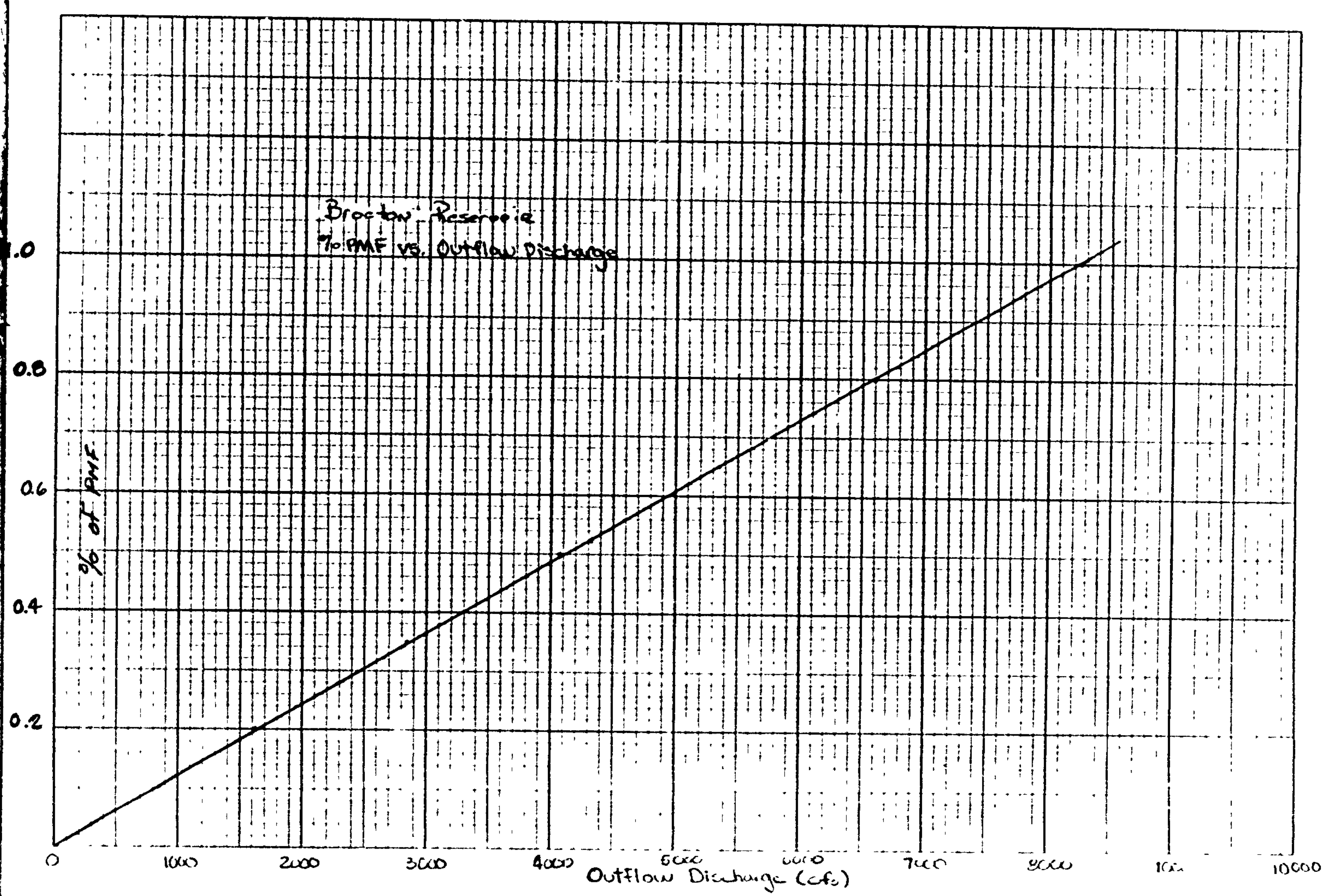
Elev.	Surface Area	Avg. Area	Incremental Storage (Acre-feet)	Total Storage	Remarks
933	16.50			0	
		17.28	36.1		Surface areas
935	18.05			36.1	were estimated
		19.55	97.8		from the contract
940	21.05			133.9	drawings
		23.68	118.4		
945	26.30			252.3	

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A. 46 0782



10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0782



NOTE: STAGE-STORAGE DATA FROM CONTRACT ENGINEERING DRAWINGS

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**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********************************
A1                 ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
A2                 HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF NY785
A3                 RATIOS OF PMF ROUTED THROUGH THE RESERVOIR
B     200       0      15       0       0       0       0       0       0       0
B1      5
J       1       6       1
J1     .2     .35      .5     .65      .8       1
K       0       1       0       0       0       0       1       0       0
K1                 CALCULATIONS OF INFLOW HYDROGRAPH
M       1       1     3.5       0     3.5       0       0       0       0       0
P       0    22.7     116     127     141
T                                                       1      .1
W    2.56     .03
X      -2     -.1       2
K       1       2       0       0       0       0       1       0       0       0
K1                             ROUTING OF INFLOW HYDROGRAPH
Y       0       0       0       1       1
Y1      1                                            -933      -1
Y4    933     934     935     936     937     938     939     940     941     942
Y5      0     194     576    1098    1738    2502    3369    4322    5377    6545
$S      0      16      36      54      72      92     112     133     155     178
$E    933     934     935     936     937     938     939     940     941     942
$$    933
$D    940     3.0     1.5   223.5
K      99
```

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**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********************************

         TIME OF EXECUTION      5-SEP-79   10:02:17

                          ANALYSIS OF DAM OVERTUPPING USING RATIOS OF PMF
                          HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF NY785
                          RATIOS OF PMF ROUTED THROUGH THE RESERVOIR

                                    JOB SPECIFICATION
     NQ       NHR      NMIN      IDAY       IHR      IMIN    METRC      IPLT      IPRT     NSTAN
    200         0        15         0         0         0        0         0         0         0
                                JOPER       NWT     LROPT    TRACE
                                    5         0         0        0

                           MULTI-PLAN ANALYSES TO BE PERFORMED
                              NPLAN= 1 NRTIO= 6 LRTIO= 1
              RTIOS=   0.20   0.35   0.50   0.65   0.80   1.00

    **********        **********        **********        **********        **********

                                SUB-AREA RUNOFF COMPUTATION

                         CALCULATIONS OF INFLOW HYDROGRAPH

                 ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                     1       0       0       0       0       0       1       0       0

                                      HYDROGRAPH DATA
     IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
         1       1    3.50    0.00    3.50    0.00   0.000       0       0       0

                                       PRECIP DATA
                  SPFE     PMS      R6     R12     R24     R48     R72     R96
                  0.00   22.70  116.00  127.00  141.00    0.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.800

                                        LOSS DATA
      LROPT  STRKR  DLTKR  RTIOL  ERAIN  STRKS  RTIOK  STRTL  CNSTL  ALSMX  RTIMP
          0   0.00   0.00   1.00   0.00   0.00   1.00   1.00   0.10   0.00   0.00

                                    UNIT HYDROGRAPH DATA
                               TP=  2.56    CP=0.63    NTA=  0

                                      RECESSION DATA
                          STRTQ=   -2.00    QRCSN=   -0.10    RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=11.27 AND R= 9.25 INTERVALS

            UNIT HYDROGRAPH 55 END-OF-PERIOD ORDINATES, LAG=  2.54 HOURS, CP= 0.63  VOL= 1.00
```

17.	65.	131.	207.	289.	375.	453.	514.	555.	575.
573.	539.	486.	436.	392.	351.	315.	283.	254.	228.
204.	184.	165.	148.	133.	119.	107.	96.	86.	77.
69.	62.	56.	50.	45.	40.	36.	32.	29.	26.
23.	21.	19.	[illegible]	[illegible]	[illegible]	12.	11.	10.	9.

McFARLAND-JOHNSON ENGINEERS, INC.

8. 7. 6. 6. 5.

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	0.15	1	0.04	0.00	0.04	7.	1.02	1.15	101	0.00	0.00	0.00	885.
1.01	0.30	2	0.04	0.00	0.04	6.	1.02	1.30	102	0.00	0.00	0.00	815.
1.01	0.45	3	0.04	0.00	0.04	6.	1.02	1.45	103	0.00	0.00	0.00	761.
1.01	1.00	4	0.04	0.00	0.04	5.	1.02	2.00	104	0.00	0.00	0.00	710.
1.01	1.15	5	0.04	0.00	0.04	5.	1.02	2.15	105	0.00	0.00	0.00	662.
1.01	1.30	6	0.04	0.00	0.04	5.	1.02	2.30	106	0.00	0.00	0.00	618.
1.01	1.45	[illegible]	0.04	0.00	0.04	4.	1.02	2.45	107	0.00	0.00	0.00	577.
1.01	2.00	8	0.04	0.00	0.04	4.	1.02	3.00	108	0.00	0.00	0.00	538.
1.01	2.15	9	0.04	0.00	0.04	4.	1.02	3.15	109	0.00	0.00	0.00	502.
1.01	2.30	10	0.04	0.00	0.04	4.	1.02	3.30	110	0.00	0.00	0.00	468.
1.01	2.45	11	0.04	0.00	0.04	3.	1.02	3.45	111	0.00	0.00	0.00	437.
1.01	3.00	12	0.04	0.00	0.04	3.	1.02	4.00	112	0.00	0.00	0.00	408.
1.01	3.15	13	0.04	0.00	0.04	3.	1.02	4.15	113	0.00	0.00	0.00	380.
1.01	3.30	14	0.04	0.00	0.04	3.	1.02	4.30	114	0.00	0.00	0.00	355.
1.01	3.45	15	0.04	0.00	0.04	2.	1.02	4.45	115	0.00	0.00	0.00	331.
1.01	4.00	16	0.04	0.00	0.04	2.	1.02	5.00	116	0.00	0.00	0.00	309.
1.01	4.15	17	0.04	0.00	0.04	2.	1.02	5.15	117	0.00	0.00	0.00	288.
1.01	4.30	18	0.04	0.00	0.04	2.	1.02	5.30	118	0.00	0.00	0.00	269.
1.01	4.45	19	0.04	0.00	0.04	2.	1.02	5.45	119	0.00	0.00	0.00	251.
1.01	5.00	20	0.04	0.00	0.04	2.	1.02	6.00	120	0.00	0.00	0.00	234.
1.01	5.15	21	0.04	0.00	0.04	2.	1.02	6.15	121	0.00	0.00	0.00	218.
1.01	5.30	22	0.04	0.00	0.04	2.	1.02	6.30	122	0.00	0.00	0.00	204.
1.01	5.45	23	0.04	0.00	0.04	1.	1.02	6.45	123	0.00	0.00	0.00	190.
1.01	6.00	24	0.04	0.01	0.04	1.	1.02	7.00	124	0.00	0.00	0.00	177.
1.01	6.15	25	0.08	0.06	0.02	3.	1.02	7.15	125	0.00	0.00	0.00	166.
1.01	6.30	26	0.08	0.06	0.02	7.	1.02	7.30	126	0.00	0.00	0.00	154.
1.01	6.45	27	0.08	0.06	0.02	15.	1.02	7.45	127	0.00	0.00	0.00	144.
1.01	7.00	28	0.08	0.06	0.02	27.	1.02	8.00	128	0.00	0.00	0.00	134.
1.01	7.15	29	0.08	0.06	0.02	45.	1.02	8.15	129	0.00	0.00	0.00	125.
1.01	7.30	30	0.08	0.06	0.02	67.	1.02	8.30	130	0.00	0.00	0.00	117.
1.01	7.45	31	0.08	0.06	0.02	94.	1.02	8.45	131	0.00	0.00	0.00	109.
1.01	8.00	32	0.08	0.06	0.02	124.	1.02	9.00	132	0.00	0.00	0.00	102.
1.01	8.15	33	0.08	0.06	0.02	156.	1.02	9.15	133	0.00	0.00	0.00	95.
1.01	8.30	34	0.08	0.06	0.02	190.	1.02	9.30	134	0.00	0.00	0.00	89.
1.01	8.45	35	0.08	0.06	0.02	223.	1.02	9.45	135	0.00	0.00	0.00	83.
1.01	9.00	36	0.08	0.06	0.02	254.	1.02	10.00	136	0.00	0.00	0.00	77.
1.01	9.15	37	0.08	0.06	0.02	282.	1.02	10.15	137	0.00	0.00	0.00	72.
1.01	9.30	38	0.08	0.06	0.02	307.	1.02	10.30	138	0.00	0.00	0.00	67.
1.01	9.45	39	0.08	0.06	0.02	329.	1.02	10.45	139	0.00	0.00	0.00	63.
1.01	10.00	40	0.08	0.06	0.02	350.	1.02	11.00	140	0.00	0.00	0.00	59.
1.01	10.15	41	0.08	0.06	0.02	368.	1.02	11.15	141	0.00	0.00	0.00	55.
1.01	10.30	42	0.08	0.06	0.02	384.	1.02	11.30	142	0.00	0.00	0.00	51.
1.01	10.45	43	0.08	0.06	0.02	398.	1.02	11.45	143	0.00	0.00	0.00	48.
1.01	11.00	44	0.08	0.06	0.02	412.	1.02	12.00	144	0.00	0.00	0.00	44.
1.01	11.15	45	0.08	0.06	0.02	423.	1.02	12.15	145	0.00	0.00	0.00	41.
1.01	11.30	46	0.08	0.06	0.02	434.	1.02	12.30	146	0.00	0.00	0.00	39.
1.01	11.45	47	0.08	0.06	0.02	443.	1.02	12.45	147	0.00	0.00	0.00	36.
1.01	12.00	48	0.08	0.06	0.02	452.	1.02	13.00	148	0.00	0.00	0.00	34.
1.01	12.15	49	0.53	0.50	0.02	467.	1.02	13.15	149	0.00	0.00	0.00	31.
1.01	12.30	50	0.53	0.50	0.02	502.	1.02	13.30	150	0.00	0.00	0.00	29.
1.01	12.45	51	0.53	0.50	0.02	566.	1.02	13.45	151	0.00	0.00	0.00	27.
1.01	13.00	52	0.53	0.50	0.02	664.	1.02	14.00	152	0.00	0.00	0.00	25.
1.01	13.15	53	0.63	0.61	0.02	799.	1.02	14.15	153	0.00	0.00	0.00	24.
1.01	13.30	54	0.63	0.61	0.02	976.	1.02	14.30	154	0.00	0.00	0.00	22.
1.01	13.45	55	0.63	0.61	0.02	1195.	1.02	[illegible]	155	0.00	0.00	0.00	21.
1.01	14.00	56	0.63	0.61	[illegible]	[illegible]	[illegible]	[illegible]	156	0.00	0.00	0.00	19.

1.01	14.15	57	0.79	0.76	0.02	1730.	1.02	15.15	157	0.00	0.00	0.00	18.
1.01	14.30	58	0.79	0.76	0.02	2038.	1.02	15.30	158	0.00	0.00	0.00	17.
1.01	14.45	59	0.79	0.76	0.02	2363.	1.02	15.45	159	0.00	0.00	0.00	16.
1.01	15.00	60	0.79	0.76	0.02	2691.	1.02	16.00	160	0.00	0.00	0.00	15.
1.01	15.15	61	0.80	0.78	0.02	3013.	1.02	16.15	161	0.00	0.00	0.00	14.
1.01	15.30	62	1.60	1.58	0.02	3342.	1.02	16.30	162	0.00	0.00	0.00	13.
1.01	15.45	63	4.48	4.46	0.03	3752.	1.02	16.45	163	0.00	0.00	0.00	12.
1.01	16.00	64	1.12	1.10	0.02	4282.	1.02	17.00	164	0.00	0.00	0.00	11.
1.01	16.15	65	0.74	0.71	0.02	4883.	1.02	17.15	165	0.00	0.00	0.00	10.
1.01	16.30	66	0.74	0.71	0.02	5514.	1.02	17.30	166	0.00	0.00	0.00	10.
1.01	16.45	67	0.74	0.71	0.02	6152.	1.02	17.45	167	0.00	0.00	0.00	9.
1.01	17.00	68	0.74	0.71	0.02	6773.	1.02	18.00	168	0.00	0.00	0.00	8.
1.01	17.15	69	0.58	0.55	0.02	7324.	1.02	18.15	169	0.00	0.00	0.00	8.
1.01	17.30	70	0.58	0.55	0.02	7758.	1.02	18.30	170	0.00	0.00	0.00	7.
1.01	17.45	71	0.58	0.55	0.02	8064.	1.02	18.45	171	0.00	0.00	0.00	7.
1.01	18.00	72	0.58	0.55	0.02	8238.	1.02	19.00	172	0.00	0.00	0.00	6.
1.01	18.15	73	0.06	0.04	0.02	8255.	1.02	19.15	173	0.00	0.00	0.00	6.
1.01	18.30	74	0.06	0.04	0.02	8080.	1.02	19.30	174	0.00	0.00	0.00	6.
1.01	18.45	75	0.06	0.04	0.02	7769.	1.02	19.45	175	0.00	0.00	0.00	5.
1.01	19.00	76	0.06	0.04	0.02	7409.	1.02	20.00	176	0.00	0.00	0.00	5.
1.01	19.15	77	0.06	0.04	0.02	7016.	1.02	20.15	177	0.00	0.00	0.00	5.
1.01	19.30	78	0.06	0.04	0.02	6593.	1.02	20.30	178	0.00	0.00	0.00	4.
1.01	19.45	79	0.06	0.04	0.02	6143.	1.02	20.45	179	0.00	0.00	0.00	4.
1.01	20.00	80	0.06	0.04	0.02	5680.	1.02	21.00	180	0.00	0.00	0.00	4.
1.01	20.15	81	0.06	0.04	0.02	5216.	1.02	21.15	181	0.00	0.00	0.00	3.
1.01	20.30	82	0.06	0.04	0.02	47[illegible]0.	1.02	21.30	182	0.00	0.00	0.00	3.
1.01	20.45	83	0.06	0.04	0.02	43[illegible]1.	1.02	21.45	183	0.00	0.00	0.00	3.
1.01	21.00	84	0.06	0.04	0.02	3914.	1.02	22.00	184	0.00	0.00	0.00	3.
1.01	21.15	85	0.06	0.04	0.02	3548.	1.02	22.15	185	0.00	0.00	0.00	3.
1.01	21.30	86	0.06	0.04	0.02	3220.	1.02	22.30	186	0.00	0.00	0.00	2.
1.01	21.45	87	0.06	0.04	0.02	2925.	1.02	22.45	187	0.00	0.00	0.00	2.
1.01	22.00	88	0.06	0.04	0.02	2660.	1.02	23.00	188	0.00	0.00	0.00	2.
1.01	22.15	89	0.06	0.04	0.02	2422.	1.02	23.15	189	0.00	0.00	0.00	2.
1.01	22.30	90	0.06	0.04	0.02	2209.	1.02	23.30	190	0.00	0.00	0.00	2.
1.01	22.45	91	0.06	0.04	0.02	2018.	1.02	23.45	191	0.00	0.00	0.00	2.
1.01	23.00	92	0.06	0.04	0.02	1847.	1.03	0.00	192	0.00	0.00	0.00	2.
1.01	23.15	93	0.06	0.04	0.02	1692.	1.03	0.15	193	0.00	0.00	0.00	1.
1.01	23.30	94	0.06	0.04	0.02	1554.	1.03	0.30	194	0.00	0.00	0.00	1.
1.01	23.45	95	0.06	0.04	0.02	1430.	1.03	0.45	195	0.00	0.00	0.00	1.
1.02	0.00	96	0.06	0.04	0.02	1319.	1.03	1.00	196	0.00	0.00	0.00	1.
1.02	0.15	97	0.00	0.00	0.00	1218.	1.03	1.15	197	0.00	0.00	0.00	1.
1.02	0.30	98	0.00	0.00	0.00	1126.	1.03	1.30	198	0.00	0.00	0.00	1.
1.02	0.45	99	0.00	0.00	0.00	1041.	1.03	1.45	199	0.00	0.00	0.00	1.
1.02	1.00	100	0.00	0.00	0.00	961.	1.03	2.00	200	0.00	0.00	0.00	1.

SUM 25.61 22.80 2.81 209793.
(650.)(579.)(71.)(5940.67)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8255.	6030.	2161.	1049.	209789.
CMS	234.	171.	61.	30.	5941.
INCHES		16.03	22.98	23.23	23.23
MM		407.10	583.57	590.11	590.11
AC-FT		2990.	4286.	4334.	4334.
THOUS CU M		3688.	5287.	5347.	5347.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
1. 1. 1. 0. 0. 0. 0.

0.	0.	0.	0.	1.	1.	3.	5.	9.	13.
19.	25.	31.	38.	45.	51.	56.	61.	66.	70.
74.	77.	80.	82.	85.	87.	89.	90.	93.	100.
113.	133.	160.	195.	239.	290.	346.	408.	473.	538.
603.	665.	750.	850.	977.	1103.	1230.	1355.	1465.	1552.
1613.	1648.	1651.	1616.	1554.	1482.	1403.	1319.	1229.	1136.
1043.	952.	864.	783.	710.	644.	585.	532.	484.	442.
404.	369.	339.	311.	286.	264.	244.	225.	208.	192.
177.	163.	152.	142.	132.	124.	115.	108.	100.	94.
87.	82.	76.	71.	66.	62.	58.	54.	50.	47.
44.	41.	38.	35.	33.	31.	29.	27.	25.	23.
22.	20.	19.	18.	17.	15.	14.	13.	13.	12.
11.	10.	10.	9.	8.	8.	7.	7.	6.	6.
5.	5.	5.	4.	4.	4.	4.	3.	3.	3.
3.	3.	2.	2.	2	2.	2.	2.	2.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1651.	1206.	432.	210.	41958.
CMS	47.	34.	12.	6.	1188.
INCHES		3.21	4.60	4.65	4.65
MM		81.42	116.71	118.02	118.02
AC-FT		598.	857.	867.	867.
THOUS CU M		738.	1057.	1069.	1069.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

2.	2.	2.	2.	2.	2.	2.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	0.	1.	1.	2.	5.	10.	16.	23.
33.	43.	55.	66.	78.	89.	99.	107.	115.	122.
129.	134.	139.	144.	148.	152.	155.	158.	163.	176.
198.	232.	280.	342.	418.	507.	605.	713.	827.	942.
1054.	1170.	1313.	1499.	1709.	1930.	2153.	2371.	2563.	2715.
2832.	2883.	2889.	2828.	2719.	2593.	2456.	2307.	2150.	1988.
1826.	1666.	1512.	1370.	1242.	1127.	1024.	931.	848.	773.
706.	646.	592.	544.	501.	462.	426.	394.	364.	336.
310.	285.	266.	248.	232.	216.	202.	188.	176.	164.
153.	143.	133.	124.	116.	108.	101.	94.	88.	82.
76.	71.	67.	62.	58.	54.	50.	47.	44.	41.
38.	36.	33.	31.	29.	27.	25.	24.	22.	20.
19.	18.	17.	16.	14.	14.	13.	12.	11.	10.
10.	9.	8.	8.	7.	7.	6.	6.	5.	5.
5.	4.	4.	4.	4.	3.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	2.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2889.	2111.	756.	317.	73426.
CMS	82.	60.	21.	10.	2079.
INCHES		5.61	8.04	8.13	8.13
MM		142.48	204.25	206.54	206.54
AC-FT		1047.	1500.	1517.	1517.
THOUS CU M		1291.	1851.	1871.	1871.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

3.	3.	3.	3.	2.	2.	2.	2.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	3.	7.	14.	22.	34.
47.	62.	78.	95.	111.	127.	141.	153.	165.	175.
184.	192.	199.	206.	212.	217.	222.	226.	234.	251.
283.	332.	399.	488.	597.	724.	865.	1019.	1181.	1345.
1506.	1671.	1870.	2141.	2442.	2757.	3076.	3387.	3662.	3879.
4032.	4119.	4128.	4040.	3884.	3704.	3508.	3296.	3072.	2840.
2608.	2380.	2160.	1957.	1774.	1610.	1462.	1330.	1211.	1105.
1009.	923.	846.	777.	715.	659.	609.	563.	520.	480.
442.	408.	380.	355.	331.	309.	288.	269.	251.	234.
218.	204.	190.	177.	166.	154.	144.	134.	125.	117.
109.	102.	95.	89.	83.	77.	72.	67.	63.	59.
55.	51.	48.	44.	41.	39.	36.	34.	31.	29.
27.	25.	24.	22.	21.	19.	18.	17.	16.	15.
14.	13.	12.	11.	10.	10.	9.	8.	8.	7.
7.	6.	6.	6.	5.	5.	5.	4.	4.	4.
3.	3.	3.	3.	3.	2.	2.	2.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4128.	3015.	1081.	52[illegible].	104895.
CMS	117.	85.	31.	1[illegible].	2970.
INCHES		8.01	11.49	11.62	11.62
MM		203.55	291.79	295.05	295.05
AC-FT		1495.	2143.	2167.	2167.
THOUS CU M		1844.	2644.	2673.	2673.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

4.	4.	4.	3.	3.	3.	3.	3.	2.	2.
2.	2.	2.	2.	2.	2.	1.	1.	1.	1.
1.	1.	1.	1.	2.	4.	10.	18.	29.	44.
61.	81.	102.	123.	145.	165.	183.	199.	214.	227.
239.	250.	259.	268.	275.	282.	288.	294.	304.	327.
368.	431.	519.	634.	776.	941.	1124.	1324.	1536.	1749.
1958.	2172.	2433.	2783.	3174.	3584.	3999.	4403.	4761.	5043.
5242.	5355.	5360.	5252.	5050.	4816.	4561.	4285.	3993.	3692.
3391.	3094.	2809.	2544.	2308.	2093.	1901.	1729.	1575.	1436.
1312.	1200.	1100.	1010.	930.	857.	792.	732.	677.	624.
575.	530.	494.	461.	4[illegible].	402.	375.	350.	326.	304.
284.	265.	247.	231.	215.	201.	187.	175.	163.	152.
142.	132.	124.	115.	106.	100.	94.	87.	82.	7[illegible].
71.	66.	62.	58.	54.	50.	47.	44.	41.	38.
36.	33.	31.	29.	27.	25.	23.	22.	20.	19.
18.	17.	15.	14.	13.	13.	12.	11.	10.	10.
9.	8.	8.	7.	7.	6.	6.	5.	5.	5.
4.	4.	4.	4.	3.	3.	3.	3.	3.	2.
2.	2.	2.	2.	2.	2.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5360.	3920.	1405.	682.	136363.
CMS	152.	111.	40.	19.	3861.
INCHES		10.42	14.93	15.10	15.10
MM		264.61	379.32	383.57	383.57
AC-FT		1944.	2786.	[illegible]	2817.
THOUS CU M		[illegible]	[illegible]	[illegible]	3475.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

5.	5.	5.	4.	4.	4.	3.	3.	3.	3.
3.	2.	2.	2.	2.	2.	2.	2.	2.	1.
1.	1.	1.	1.	2.	5.	12.	22.	36.	54.
75.	99.	125.	152.	178.	203.	225.	245.	263.	280.
294.	307.	319.	329.	339.	347.	355.	361.	374.	402.
453.	531.	639.	781.	956.	1158.	1364.	1630.	1890.	2153.
2410.	2674.	3002.	3426.	3907.	4411.	4922.	5418.	5859.	6207.
6451.	6590.	6604.	6464.	6215.	5927.	5613.	5274.	4914.	4544.
4173.	3808.	3457.	3131.	2838.	2576.	2340.	2128.	1938.	1767.
1614.	1477.	1354.	1243.	1144.	1055.	975.	901.	833.	769.
708.	652.	609.	568.	530.	494.	461.	430.	402.	375.
350.	326.	304.	284.	265.	247.	231.	215.	201.	187.
175.	163.	152.	142.	132.	124.	115.	108.	100.	94.
87.	82.	76.	71.	66.	62.	58.	54.	50.	47.
44.	41.	38.	35.	33.	31.	29.	27.	25.	23.
22.	20.	19.	18.	17.	15.	14.	13.	13.	12.
11.	10.	10.	9.	8.	8.	7.	7.	6.	6.
5.	5.	5.	4.	4.	4.	4.	3.	3.	3.
3.	3.	2.	2.	2.	2.	2.	2.	2.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6604.	4824.	1729.	839.	167832.
CMS	187.	137.	49.	24.	4752.
INCHES		12.82	18.38	18.59	18.59
MM		325.68	466.86	472.08	472.08
AC-FT		2392.	3429.	3468.	3468.
THOUS CU M		2951.	4230.	4277.	4277.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

7.	6.	6.	5.	5.	5.	4.	4.	4.	4.
3.	3.	3.	3.	2.	2.	2.	2.	2.	2.
2.	2.	1.	1.	3.	7.	15.	27.	45.	67.
94.	124.	156.	190.	223.	254.	282.	307.	329.	350.
368.	384.	398.	412.	423.	434.	443.	452.	467.	502.
566.	604.	799.	976.	1195.	1448.	1730.	2036.	2363.	2691.
3013.	3342.	3752.	4282.	4883.	5514.	6152.	6773.	7324.	7758.
8064.	[illegible]238.	8255.	8080.	7769.	7409.	7016.	6593.	6143.	5680.
5216.	[illegible]760.	4321.	3914.	3548.	3220.	2925.	2660.	2422.	2209.
2018.	1847.	1692.	1554.	1430.	1319.	1218.	1126.	1041.	961.
885.	815.	761.	710.	662.	618.	577.	538.	502.	468.
437.	408.	380.	355.	331.	309.	288.	269.	251.	234.
218.	204.	190.	177.	166.	154.	144.	134.	125.	117.
109.	102.	95.	89.	83.	77.	72.	67.	63.	59.
55.	51.	48.	44.	41.	39.	36.	34.	31.	29.
27.	25.	24.	22.	21.	19.	18.	17.	16.	15.
14.	13.	12.	11.	10.	10.	9.	8.	8.	7.
7.	6.	6.	6.	5.	5.	5.	4.	4.	4.
3.	3.	3.	3.	3.	2.	2.	2.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8255.	6030.	2161.	1049.	209769.
CMS	234.	171.	61.	[illegible]	5941.
INCHES		[illegible]	[illegible]	[illegible]	23.23

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

5.	5.	5.	4.	4.	4.	3.	3.	3.	3.
3.	2.	2.	2.	2.	2.	2.	2.	2.	1.
1.	1.	1.	1.	2.	5.	12.	22.	36.	54.
75.	99.	125.	152.	178.	203.	225.	245.	263.	280.
294.	307.	319.	329.	339.	347.	355.	361.	374.	402.
453.	531.	639.	781.	956.	1158.	1384.	1630.	1890.	2153.
2410.	2674.	3002.	3426.	3907.	4411.	4922.	5418.	5859.	6207.
6451.	6590.	6604.	6464.	6215.	5927.	5613.	5274.	4914.	4544.
4173.	3808.	3457.	3131.	2838.	2576.	2340.	2128.	1938.	1767.
1614.	1477.	1354.	1243.	1144.	1055.	975.	901.	833.	769.
708.	652.	609.	568.	530.	494.	461.	430.	402.	375.
350.	326.	304.	284.	265.	247.	231.	215.	201.	187.
175.	163.	152.	142.	132.	124.	115.	108.	100.	94.
87.	82.	76.	71.	66.	62.	58.	54.	50.	47.
44.	41.	38.	35.	33.	31.	29.	27.	25.	23.
22.	20.	19.	18.	17.	15.	14.	13.	13.	12.
11.	10.	10.	9.	8.	8.	7.	7.	6.	6.
5.	5.	5.	4.	4.	4.	4.	3.	3.	3.
3.	3.	2.	2.	2.	2.	2.	2.	2.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6604.	4824.	1729.	839.	167832.
CMS	187.	137.	49.	24.	4752.
INCHES		12.82	18.38	18.59	18.59
MM		325.68	466.86	472.08	472.08
AC-FT		2392.	3429.	3468.	3468.
THOUS CU M		2951.	4230.	4277.	4277.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

7.	6.	6.	5.	5.	5.	4.	4.	4.	[illegible]
3.	3.	3.	3.	2.	2.	2.	2.	2.	2.
2.	2.	1.	1.	3.	7.	15.	27.	45.	67.
94.	124.	156.	190.	223.	254.	282.	307.	329.	350.
368.	384.	398.	412.	423.	434.	443.	452.	467.	502.
566.	604.	799.	976.	1195.	1448.	1730.	2038.	2363.	2691.
3013.	3342.	3752.	4282.	4883.	5514.	6152.	6773.	7324.	7758.
8064.	238.	8255.	8080.	7769.	7409.	7016.	6593.	6143.	5680.
5216.	[illegible]760.	4321.	3914.	3548.	3220.	2925.	2660.	2422.	2209.
2018.	1847.	1692.	1554.	1430.	1319.	1218.	1126.	1041.	961.
885.	815.	761.	710.	662.	618.	577.	538.	502.	468.
437.	408.	380.	355.	331.	309.	288.	269.	251.	234.
218.	204.	190.	177.	166.	154.	144.	134.	125.	117.
109.	102.	95.	89.	83.	77.	72.	67.	63.	59.
55.	51.	48.	44.	41.	39.	36.	34.	31.	29.
27.	25.	24.	22.	21.	19.	18.	17.	16.	15.
14.	13.	12.	11.	10.	10.	9.	8.	8.	7.
7.	6.	6.	6.	5.	5.	5.	4.	4.	4.
3.	3.	3.	3.	3.	2.	2.	2.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8255.	6030.	2161.	1049.	209769.
CMS	234.	171.	61.	[illegible]	5941.
INCHES		[illegible]	2[illegible]	[illegible]	23.23

MM	407.10	583.57	590.11	590.11
AC-FT	2990.	4286.	4334.	4334.
THOUS CU M	3688.	5287.	5347.	5347.

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HYDROGRAPH ROUTING

ROUTING OF INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-933.	-1

STAGE	933.00	934.00	935.00	936.00	937.00	938.00	939.00	940.00	941.00	942.00
FLOW	0.00	194.00	576.00	1098.00	1738.00	2502.00	3369.00	4322.00	5377.00	6545.00
CAPACITY=	0.	16.	36.	54.	72.	92.	112.	133.	155.	178.
ELEVATION=	933.	934.	935.	936.	937.	938.	939.	940.	941.	942.

CREL	SPWID	COQW	EXPW	ELEVL	COOL	CAREA	EXPL
933.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
940.0	3.0	1.5	223.

STATION 2, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	0.	0.
0.	0.	0.	0.	0.	1.	1.	2.	3.	5.
7.	10.	14.	19.	24.	29.	35.	40.	45.	50.
55.	59.	64.	67.	71.	74.	77.	80.	83.	86.
90.	97.	108.	124.	144.	171.	208.	264.	322.	382.
444.	507.	574.	679.	788.	904.	1025.	1157.	1293.	1408.
1502.	1571.	1613.	1624.	1603.	1557.	1496.	1423.	1343.	1257.
1167.	1079.	1000.	919.	839.	764.	695.	632.	575.	538.
500.	463.	427.	393.	362.	353.	307.	283.	261.	241.
222.	205.	191.	181.	172.	162.	152.	143.	135.	126.
116.	111.	104.	97.	91.	85.	80.	74.	69.	65.
60.	56.	53.	49.	46.	43.	40.	37.	35.	32.
30.	28.	26.	25.	23.	21.	20.	19.	17.	16.
15.	14.	13.	12.	11.	11.	10.	9.	9.	8.
6.	7.	7.				5.	5.	4.	4.

4.	4.	3.	3.	3.	3.	2.	2.	2.	2.
2.	2.	2.	2.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	1.	1.	2.	2.	2.	3.	3.	4.	4.
5.	5.	5.	6.	6.	6.	6.	7.	7.	7.
7.	8.	9.	10.	12.	14.	17.	20.	23.	26.
29.	32.	36.	40.	43.	47.	51.	56.	59.	63.
65.	67.	68.	69.	68.	67.	65.	63.	61.	58.
56.	53.	51.	48.	45.	42.	40.	38.	36.	34.
32.	30.	28.	26.	25.	23.	22.	21.	20.	18.
17.	17.	16.	15.	14.	13.	13.	12.	11.	10.
10.	9.	9.	8.	8.	7.	7.	6.	6.	5.
5.	5.	4.	4.	4.	4.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STAGE

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.1	933.1	933.1	933.1	933.2	933.2	933.2	933.2	933.3
933.3	933.3	933.3	933.3	933.4	933.4	933.4	933.4	933.4	933.4
933.5	933.5	933.6	933.5	933.7	933.9	934.0	934.2	934.3	934.5
934.7	934.8	935.0	935.2	935.4	935.6	935.9	936.1	936.3	936.5
936.6	936.7	936.8	936.8	936.8	936.7	936.6	936.5	936.4	936.2
936.1	936.0	935.8	935.7	935.5	935.4	935.2	935.1	935.0	934.9
934.8	934.7	934.6	934.5	934.4	934.4	934.3	934.2	934.2	934.1
934.1	934.0	934.0	933.9	933.9	933.8	933.8	933.7	933.7	933.7
933.6	933.6	933.5	933.5	933.5	933.4	933.4	933.4	933.4	933.3
933.3	933.3	933.3	933.3	933.2	933.2	933.2	933.2	933.2	933.2
933.2	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1
933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0

PEAK OUTFLOW IS 1624. AT TIME 18.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1624.	1195.	432.	210.	41961.
CMS	46.	34.	12.	6.	1188.
INCHES		3.18	4.59	4.65	4.65
MM		80.68	116.57	118.03	118.03
AC-FT		593.	856.	867.	867.
THOUS CU M		731.	1056.	1069.	1069.

STATION 2, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1.	1.	1.	1.	1.	1.	2.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	2.	3.	5.	8.
13.	18.	25.	33.	42.	51.	60.	70.	79.	88.
96.	104.	111.	118.	124.	129.	135.	139.	144.	149.
158.	171.	190.	227.	278.	339.	410.	492.	587.	724.
850.	971.	1096.	1262.	1446.	1647.	1865.	2090.	2303.	2493.
2663.	2780.	2846.	2854.	2804.	2713.	2596.	2467.	2332.	2183.
2027.	1868.	1712.	1566.	1426.	1296.	1178.	1074.	989.	907.
830.	759.	695.	636.	584.	548.	514.	480.	447.	415.
385.	356.	329.	306.	284.	264.	246.	229.	214.	199.
188.	179.	170.	161.	152.	143.	134.	126.	118.	111.
104.	97.	91.	85.	80.	75.	70.	65.	61.	57.
53.	49.	46.	43.	40.	37.	35.	33.	30.	28.
26.	25.	23.	21.	20.	19.	17.	16.	15.	14.
13.	12.	11.	11.	10.	9.	9.	8.	8.	7.
7.	6.	6.	5.	5.	5.	4.	4.	4.	4.
3.	3.	3.	3.	3.	2.	2.	2.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	0.	0.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
1.	2.	2.	3.	3.	4.	5.	6.	7.	7.
8.	9.	9.	10.	10.	11.	11.	11.	12.	12.
13.	14.	16.	18.	20.	24.	27.	32.	36.	41.
45.	50.	54.	59.	64.	69.	75.	81.	87.	92.
96.	98.	100.	100.	99.	97.	94.	91.	88.	84.
80.	75.	71.	67.	63.	60.	56.	53.	50.	47.
45.	42.	40.	38.	36.	35.	33.	31.	29.	28.
26.	24.	23.	22.	21.	20.	19.	18.	17.	16.
16.	15.	14.	13.	13.	12.	11.	10.	10.	9.
9.	8.	8.	7.	7.	6.	6.	5.	5.	5.
4.	4.	4.	4.	3.	3.	3.	3.	3.	2.
2.	2.	2.	2.	2.	2.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STAGE

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.1	933.1	933.1	933.2	933.2	933.3	933.3	933.4	933.4	933.5
933.5	933.5	933.6	933.6	933.6	933.7	933.7	933.7	933.7	933.8
933.8	933.9	934.0	934.1	934.2	934.4	934.6	934.8	935.0	935.3
935.5	935.8	936.0	936.3	936.5	936.9	937.2	937.5	937.7	938.0
938.2	938.3	938.4	938.4	938.3	938.2	938.1	938.0	937.8	937.6
937.4	937.2	937.0	936.7	936.5	936.3	936.1	936.0	935.8	935.6
935.5	935.4	935.2	935.1	935.0	934.9	934.8	934.7	934.7	934.6
934.5	934.4	934.4	[illegible]	[illegible]	[illegible]	934.1	934.1	934.1	934.0

934.0	933.9	933.9	933.8	933.8	933.7	933.7	933.7	933.6	933.6
933.5	933.5	933.5	933.4	933.4	933.4	933.4	933.3	933.3	933.3
933.3	933.3	933.2	933.2	933.2	933.2	933.2	933.2	933.2	933.1
933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1
933.1	933.1	933.1	933.1	933.1	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0

PEAK OUTFLOW IS 2854. AT TIME 18.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2854.	2099.	755.	367.	73422.
CMS	81.	59.	21.	10.	2079.
INCHES		5.58	8.03	8.13	8.13
MM		141.70	203.97	206.53	206.53
AC-FT		1041.	1498.	1517.	1517.
THOUS CU M		1284.	1848.	1871.	1871.

STATION 2, PLAN 1, RATIO 3

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1.	1.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	2.	4.	7.	12.
16.	26.	36.	47.	60.	73.	86.	100.	113.	126.
138.	149.	159.	169.	178.	186.	193.	203.	212.	222.
237.	266.	295.	344.	409.	492.	598.	757.	915.	1076.
1260.	1437.	1616.	1833.	2092.	2379.	2700.	3029.	3335.	3612.
3831.	3987.	4074.	4080.	4005.	3871.	3702.	3511.	3304.	3089.
2863.	2635.	2417.	2214.	2017.	1833.	1669.	1522.	1387.	1264.
1153.	1059.	979.	902.	830.	764.	704.	650.	600.	560.
528.	494.	461.	430.	401.	375.	350.	326.	304.	284.
265.	247.	231.	215.	201.	190.	181.	172.	162.	153.
144.	136.	127.	119.	112.	105.	98.	92.	86.	81.
75.	70.	66.	61.	57.	53.	50.	47.	43.	41.
38.	35.	33.	31.	29.	27.	25.	23.	22.	20.
19.	18.	16.	15.	14.	13.	12.	12.	11.	10.
9.	9.	8.	8.	7.	7.	6.	6.	5.	5.
5.	4.	4.	4.	4.	3.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	2.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	1.	1.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
11.	12.	13.	14.	15.	15.	16.	16.	17.	17.
18.	19.	21.	24.	27.	32.	37.	42.	48.	53.
59.	64.	69.	74.	81.	89.	97.	104.	111.	117.
122.	126.	128.	128.	126.	123.	119.	115.	111.	106.
100.	95.	90.	84.	79.	74.	70.	66.	62.	59.
56.	53.	50.	47.	45.	42.	40.	39.	37.	35.
33.	32.	30.	[illegible]	[illegible]	[illegible]	24.	23.	22.	21.

McFARLAND - JOHNSON ENGINEERS, INC.

20.	19.	18.	17.	16.	16.	15.	14.	13.	13.
12.	11.	11.	10.	9.	9.	8.	8.	7.	7.
6.	6.	5.	5.	5.	4.	4.	4.	4.	3.
3.	3.	3.	3.	2.	2.	2.	2.	2.	2.
2.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STAGE

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.1
933.1	933.1	933.2	933.2	933.3	933.4	933.4	933.5	933.6	933.6
933.7	933.8	933.8	933.9	933.9	934.0	934.0	934.0	934.0	934.1
934.1	934.2	934.3	934.4	934.6	934.8	935.0	935.3	935.6	936.0
936.3	936.5	936.8	937.1	937.5	937.8	938.2	938.6	939.0	939.3
939.5	939.6	939.7	939.7	939.7	939.5	939.3	939.1	938.9	938.7
938.4	938.2	937.9	937.6	937.4	937.1	936.9	936.7	936.5	936.3
936.1	935.9	935.8	935.6	935.5	935.4	935.2	935.1	935.0	935.0
934.9	934.8	934.7	934.6	934.5	934.5	934.4	934.3	934.3	934.2
934.2	934.1	934.1	934.1	934.0	934.0	933.9	933.9	933.8	933.8
933.7	933.7	933.7	933.6	933.6	933.5	933.5	933.5	933.4	933.4
933.4	933.4	933.3	933.3	933.3	933.3	933.3	933.2	933.2	933.2
933.2	933.2	933.2	933.2	933.1	933.1	933.1	933.1	933.1	933.1
933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0

PEAK OUTFLOW IS 4080. AT TIME 13.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4080.	3002.	1079.	525.	104901.
CMS	116.	85.	31.	15.	2970.
INCHES		7.98	11.47	11.62	11.62
MM		202.68	291.42	295.07	295.07
AC-FT		1489.	2141.	2167.	2167.
THOUS CU M		1836.	2640.	2673.	2673.

STATION 2, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1.	2.	2.	2.	3.	3.	3.	3.	3.	3.
3.	2.	2.	2.	2.	2.	2.	2.	2.	2.
1.	1.	1.	1.	1.	2.	3.	5.	9.	15.
24.	34.	47.	61.	78.	95.	112.	130.	147.	163.
179.	193.	213.	230.	243.	255.	265.	273.	282.	293.
311.	340.	385.	448.	533.	666.	835.	1015.	1224.	1449.
1666.	1866.	2125.	2400.	2748.	3139.	3548.	3965.	4363.	4803.
5105.	5282.	5354.	5312.	5163.	4955.	4722.	4475.	4237.	3985.
3702.	3408.	3124.	2847.	2586.	2360.	2155.	1962.	1787.	1633.
1494.	1360.	1250.	1145.	1058.	962.	910.	842.	778.	719.
664.	613.	569.	[illegible]	[illegible]	[illegible]	448.	420.	393.	367.

343.	321.	299.	279.	261.	243.	227.	212.	198.	188.
179.	169.	160.	151.	142.	134.	126.	118.	110.	104.
97.	91.	85.	79.	74.	69.	65.	60.	56.	53.
49.	46.	43.	40.	37.	35.	32.	30.	28.	26.
25.	23.	21.	20.	19.	17.	16.	15.	14.	13.
12.	11.	11.	10.	9.	9.	8.	8.	7.	7.
6.	6.	5.	5.	5.	4.	4.	4.	4.	3.
3.	3.	3.	2.	2.	2.	2.	2.	2.	2.
2.	1.	1.	1.	1.	1.	1.	1.	1.	1.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	1.	1.
2.	3.	4.	5.	6.	8.	9.	11.	12.	13.
15.	16.	17.	18.	19.	19.	20.	20.	21.	21.
22.	24.	26.	29.	34.	39.	45.	51.	58.	64.
70.	76.	82.	89.	98.	107.	116.	125.	134.	140.
144.	146.	147.	147.	145.	142.	139.	136.	131.	126.
119.	113.	106.	100.	94.	88.	83.	78.	73.	69.
65.	62.	58.	55.	53.	50.	46.	45.	43.	41.
39.	37.	35.	34.	32.	31.	29.	28.	26.	25.
24.	23.	22.	20.	19.	19.	18.	17.	16.	15.
15.	14.	13.	12.	12.	11.	10.	10.	9.	9.
8.	7.	7.	7.	6.	6.	5.	5.	5.	4.
4.	4.	4.	3.	3.	3.	3.	2.	2.	2.
2.	2.	2.	2.	2.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STAGE

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.1
933.1	933.2	933.2	933.3	933.4	933.5	933.6	933.7	933.8	933.8
933.9	934.0	934.1	934.1	934.1	934.2	934.2	934.2	934.2	934.3
934.3	934.4	934.5	934.7	934.9	935.2	935.5	935.8	936.2	936.5
936.9	937.2	937.5	937.9	938.3	938.7	939.2	939.6	940.0	940.3
940.5	940.6	940.6	940.6	940.5	940.4	940.3	940.1	939.9	939.6
939.3	939.0	938.7	938.4	938.1	937.8	937.5	937.3	937.1	936.8
936.6	936.4	936.2	936.1	935.9	935.8	935.6	935.5	935.4	935.3
935.2	935.1	935.0	934.9	934.8	934.7	934.7	934.6	934.5	934.5
934.4	934.3	934.3	934.2	934.2	934.1	934.1	934.0	934.0	934.0
933.9	933.9	933.8	933.8	933.7	933.7	933.6	933.6	933.6	933.5
933.5	933.5	933.4	933.4	933.4	933.4	933.3	933.3	933.3	933.3
933.3	933.2	933.2	933.2	933.2	933.2	933.2	933.2	933.1	933.1
933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1
933.1	933.1	933.1	933.1	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0

PEAK OUTFLOW IS 5354. AT TIME 18.25 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5354.	3905.	1403.	662.	136369.
CMS	152.	111.	40.	[illegible]	3862.
INCHES	[illegible]	[illegible]	[illegible]	[illegible]	15.10

McFARLAND, JOHNSON ENGINEERS, INC.

MM	263.64	378.85	383.58	383.58
AC-FT	1936.	2783.	2818.	2818.
THOUS CU M	2389.	3432.	3475.	3475.

STATION 2, PLAN 1, RATIO 5

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1.	2.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	2.	2.	2.	2.	2.
2.	2.	2.	1.	2.	2.	3.	6.	11.	19.
29.	42.	57.	75.	95.	117.	138.	160.	181.	205.
232.	254.	274.	290.	305.	317.	328.	338.	346.	361.
383.	419.	474.	551.	688.	858.	1048.	1287.	1541.	1802.
2073.	2339.	2632.	2992.	3410.	3888.	4394.	5051.	5597.	6019.
6327.	6522.	6598.	6533.	6339.	6072.	5777.	5459.	5121.	4773.
4431.	4135.	3814.	3482.	3171.	2884.	2620.	2391.	2189.	1999.
1825.	1670.	1534.	1407.	1293.	1189.	1096.	1023.	951.	882.
816.	753.	697.	647.	602.	565.	536.	506.	477.	447.
419.	392.	367.	343.	320.	299.	279.	261.	243.	227.
212.	198.	188.	179.	169.	160.	151.	142.	134.	126.
118.	110.	104.	97.	91.	85.	79.	74.	69.	65.
60.	56.	53.	49.	46.	43.	40.	37.	35.	32.
30.	28.	26.	25.	23.	21.	20.	19.	17.	16.
15.	14.	13.	12.	11.	11.	10.	9.	9.	8.
8.	7.	7.	6.	6.	5.	5.	5.	4.	4.
4.	4.	3.	3.	3.	3.	2.	2.	2.	2.
2.	2.	2.	2.	1.	1.	1.	1.	1.	1.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	1.	1.	2.
2.	3.	5.	6.	8.	10.	11.	13.	15.	17.
18.	19.	20.	21.	22.	22.	23.	24.	24.	25.
26.	28.	31.	35.	40.	46.	52.	59.	66.	74.
81.	86.	95.	103.	113.	123.	134.	144.	150.	155.
158.	160.	161.	160.	158.	155.	152.	148.	144.	140.
135.	129.	122.	114.	107.	101.	95.	89.	84.	79.
74.	70.	66.	63.	59.	57.	54.	51.	49.	47.
44.	42.	40.	38.	37.	35.	34.	32.	31.	29.
28.	26.	25.	24.	23.	22.	20.	19.	19.	18.
17.	16.	15.	15.	14.	13.	12.	12.	11.	10.
10.	9.	9.	8.	7.	7.	7.	6.	6.	5.
5.	5.	4.	4.	4.	4.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STAGE

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.1	933.1
933.1	933.2	933.3	933.4	933.5	933.6	933.7	933.8	933.9	934.0
934.1	934.2	934.2	934.3	934.3	934.3	934.4	934.4	934.4	934.4
934.5	934.6	934.7	[illegible]	[illegible]	[illegible]	[illegible]	936.3	936.7	937.1

937.4	937.8	938.2	938.6	939.0	939.5	940.1	940.5	940.8	941.0
941.1	941.2	941.2	941.2	941.1	941.0	940.9	940.7	940.5	940.3
940.1	939.8	939.5	939.1	938.8	938.4	938.1	937.9	937.6	937.3
937.1	936.9	936.7	936.5	936.3	936.1	936.0	935.9	935.7	935.6
935.5	935.3	935.2	935.1	935.0	935.0	934.9	934.8	934.7	934.7
934.6	934.5	934.5	934.4	934.3	934.3	934.2	934.2	934.1	934.1
934.0	934.0	934.0	933.9	933.9	933.8	933.8	933.7	933.7	933.6
933.6	933.6	933.5	933.5	933.5	933.4	933.4	933.4	933.4	933.3
933.3	933.3	933.3	933.3	933.2	933.2	933.2	933.2	933.2	933.2
933.2	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1
933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0

PEAK OUTFLOW IS 6598. AT TIME 18.25 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6598.	4809.	1727.	839.	167837.
CMS	187.	136.	49.	24.	4753.
INCHES		12.78	18.36	18.59	18.59
MM		324.65	466.28	472.10	472.10
AC-FT		2385.	3425.	3468.	3468.
THOUS CU M		2941.	4225.	4277.	4277.

STATION 2, PLAN 1, RATIO 6

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1.	3.	3.	4.	4.	4.	4.	4.	4.	4.
4.	3.	4.	3.	3.	3.	3.	3.	3.	2.
2.	2.	2.	2.	2.	3.	4.	8.	14.	24.
36.	52.	72.	94.	119.	146.	173.	203.	241.	273.
301.	326.	347.	366.	383.	398.	411.	423.	435.	452.
479.	524.	599.	732.	895.	1091.	1357.	1640.	1952.	2277.
2612.	2962.	3324.	3765.	4287.	5034.	5782.	6455.	7061.	7561.
7930.	8165.	8252.	8162.	7910.	7571.	7197.	6793.	6363.	5916.
5467.	5025.	4604.	4243.	3916.	3576.	3258.	2970.	2705.	2467.
2267.	2076.	1903.	1745.	1609.	1483.	1368.	1263.	1167.	1081.
1008.	935.	867.	806.	751.	700.	653.	609.	570.	542.
513.	483.	454.	425.	398.	372.	348.	325.	304.	284.
265.	247.	231.	215.	201.	190.	181.	172.	162.	153.
144.	136.	127.	119.	112.	105.	98.	92.	86.	81.
75.	70.	66.	61.	57.	53.	50.	47.	43.	41.
38.	35.	33.	31.	29.	27.	25.	23.	22.	20.
19.	18.	16.	15.	14.	13.	12.	12.	11.	10.
9.	9.	8.	8.	7.	7.	6.	6.	5.	5.
5.	4.	4.	4.	4.	3.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	2.	1.	1.	1.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	1.	1.	2.
3.	4.	6.	8.	10.	12.	14.	16.	18.	20.
22.	23.	24.	25.	26.	27.	27.	28.	29.	29.
31.	33.	37.	[illegible]	[illegible]	[illegible]	61.	69.	78.	86.

95.	103.	111.	121.	132.	143.	152.	159.	165.	170.
173.	176.	176.	176.	173.	170.	167.	163.	159.	154.
149.	143.	138.	131.	124.	117.	109.	103.	97.	91.
86.	81.	76.	72.	66.	65.	62.	59.	56.	53.
51.	48.	46.	44.	42.	40.	39.	37.	36.	34.
33.	31.	30.	28.	27.	25.	24.	23.	22.	21.
20.	19.	18.	17.	16.	16.	15.	14.	13.	13.
12.	11.	11.	10.	9.	9.	8.	8.	7.	7.
6.	6.	5.	5.	5.	4.	4.	4.	4.	3.
3.	3.	3.	3.	2.	2.	2.	2.	2.	2.
2.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STAGE

933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.1	933.1
933.2	933.3	933.4	933.5	933.6	933.8	933.9	934.0	934.1	934.2
934.3	934.3	934.4	934.5	934.5	934.5	934.6	934.6	934.6	934.7
934.7	934.9	935.0	935.3	935.6	936.0	936.4	936.8	937.3	937.7
938.1	938.5	938.9	939.4	940.0	940.5	940.9	941.2	941.4	941.7
941.6	941.9	941.9	941.9	941.8	941.7	941.5	941.3	941.1	940.9
940.7	940.5	940.2	939.9	939.6	939.2	938.9	938.5	938.2	938.0
937.7	937.4	937.2	937.0	936.8	936.6	936.4	936.3	936.1	936.0
935.8	935.7	935.6	935.4	935.3	935.2	935.1	935.1	935.0	934.9
934.8	934.8	934.7	934.6	934.5	934.5	934.4	934.3	934.3	934.2
934.2	934.1	934.1	934.1	934.0	934.0	933.9	933.9	933.8	933.8
933.7	933.7	933.7	933.6	933.6	933.5	933.5	933.5	933.4	933.4
933.4	933.4	933.3	933.3	933.3	933.3	933.3	933.2	933.2	933.2
933.2	933.2	933.2	933.2	933.1	933.1	933.1	933.1	933.1	933.1
933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1	933.1
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0
933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0	933.0

PEAK OUTFLOW IS 8252. AT TIME 18.25 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8252.	6014.	2159.	1049.	209796.
CMS	234.	170.	61.	30.	5941.
INCHES		15.98	22.95	23.23	23.23
MM		405.96	582.88	590.13	590.13
AC-FT		2982.	4281.	4335.	4335.
THOUS CU M		3678.	5281.	5347.	5347.

********** ********** ********** ********** **********

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 0.20	RATIO 2 0.35	RATIO 3 0.50	RATIO 4 0.65	RATIO 5 0.80	RATIO 6 1.00
				RATIOS APPLIED TO FLOWS					
HYDROGRAPH AT	1	3.50	1	1651.	2889.	4128.	5366.	6604.	8255.
	(	9.06)	(	46.75)(	81.82)(	116.88)(	151.95)(	187.01)(	233.76)(
ROUTED TO	2	3.50	1	1624.	2854.	4080.	5354.	6598.	8252.
	(	9.06)	(	45.98)(	80.81)(	115.54)(	151.61)(	186.83)(	233.67)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

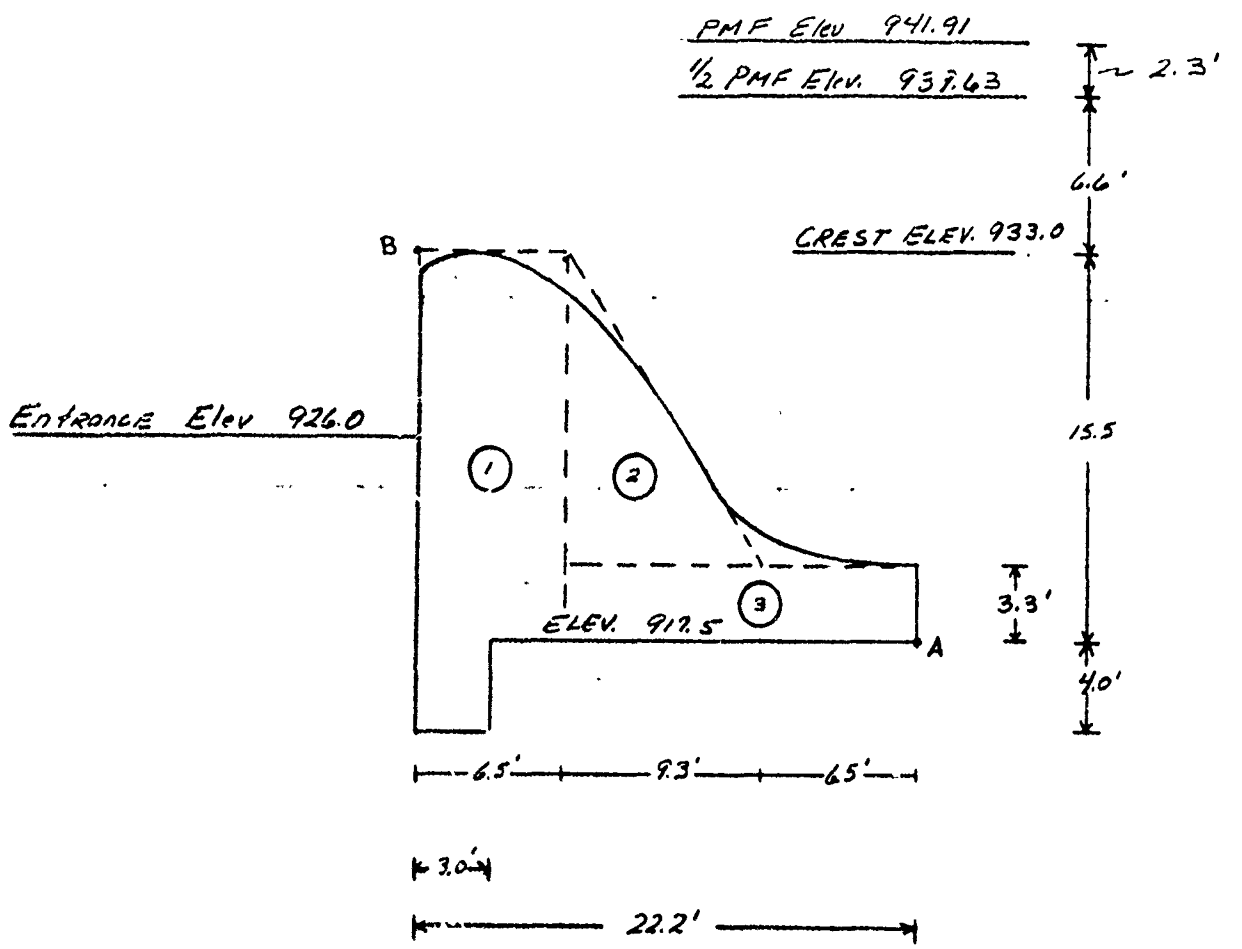
	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	933.00	933.00	940.00
STORAGE	0.	0.	133.
OUTFLOW	0.	0.	4322.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.20	936.82	0.00	69.	1624.	0.00	15.50	0.00
0.35	938.41	0.00	100.	2854.	0.00	15.50	0.00
0.50	939.75	0.00	128.	4060.	0.00	15.50	0.00
0.65	940.65	0.65	147.	5354.	2.50	15.25	0.00
0.80	941.25	1.25	161.	6598.	3.75	15.25	0.00
1.00	941.93	1.93	176.	8252.	4.50	15.25	0.00

APPENDIX D

STRUCTURAL STABILITY ANALYSIS

Brocton Reservoir Spillway



Subarea Calculations

Area No	Area (ft.²)	Volume (ft³)	Moment Arm from pt. A	Moment about pt. A
1	15.5×6.5	15.5×6.5×1	$6.5\times 9.3 + \frac{6.5}{2}$	
	(100.75)	(100.75)	(19.05)	1919.29
2	½×9.3×12.2	½×9.3×12.2×1	6.5 + ⅔(9.3)	
	(56.73)	(56.73)	(12.7)	720.47
3	[9.3+6.5]×3.3	[9.3+6.5]×3.3×1	$\frac{[9.3+6.5]}{2}$	
	(52.14)	(52.14)	(7.9)	411.91
	ΣA = 209.62			(+) ΣM_A = 3051.67

$$\frac{\Sigma M_A}{\Sigma A} = \frac{3051.67}{209.62} = 14.56' \text{ left from pt. A}$$

② Determine Centroid (C)

Area No.	Area	Moment Arm from pt. B	Moment about pt. B
1	100.75	$\frac{15.5}{2}$	780.81
2	56.73	$(12.2)\,2/3$	461.40
3	52.14	$(12.2) + \frac{3.3}{2}$	722.14

$\Sigma A = 209.62$ $\quad\Sigma M_B = 1964.35$

$$\frac{\Sigma M_B}{\Sigma A} = \frac{1964.35}{209.62} = 9.37' \text{ down from B}$$

③ Determine Weight of Concrete above Elev. 917.5 (W_c)

Total Volume = 209.62 ft^3

W_c = 209.62 ft^3 x 150 pcf = 31.44 kips/lin. ft.

④ Determine Water Force for following Conditions (P_w)

A. Normal Pool Elev. 933.0

B. ½ PMF Elev. 939.6

C. PMF Elev. 941.9

4a. Normal Conditions

$$P_{WN} = \tfrac{1}{2}\,\gamma_w\, h_N^2$$

$$= \frac{(\tfrac{1}{2})(62.4)(933-917.5)^2}{1000} = 7.5 \text{ Kips/lin.ft.}$$

R_N - Resultant acts 5.17' above BASE

4b. ½ PMF

$$P_{W_{1/2\,PMF}} = (h_{1/2} - h_N)(h_N)\,\gamma_w + P_{WN}$$

$$= (939.6-933.0)(933.0-917.5) + \frac{(933-917.5)^2\,62.4}{2}$$

$$= 13.9 \text{ Kips/lin.ft.}$$

$R_{1/2\,PMF}$ - Resultant acts 6.36' above BASE

4c. Full PMF

$$P_{W_{PMF}} = (h_{PMF} - h_N)(h_N)\,\gamma_w + P_{WN}$$

$$= (941.9-933.0)(933.0-917.5)(62.4) + \frac{933-917.5^2\,62.4}{2}$$

$$= 16.1 \text{ Kips/lin.ft}$$

R_{PMF} - Resultant acts 6.54 above BASE

(5) Determine Ice Load (P_I)

$$P_{I\,MAX} = \frac{5000\text{ psf} \times 2'\text{ deep}}{1000} = 10 \text{ Kips/lin.ft.}$$

$R_{I\,MAX}$ - Resultant acts 14.5' above BASE

$$P_{I\,MIN} = \frac{5000\text{ psf} \times 1'\text{ deep}}{1000} = 5 \text{ Kips/lin.ft}$$

$R_{I\,MIN}$ - Resultant acts 15.0' above BASE

4a. Normal Conditions

$$P_{WN} = \tfrac{1}{2}\,\gamma_w\,h_N^2$$

$$= \frac{(1/2)(62.4)(933-917.5)^2}{1000} = 7.5 \text{ Kips/lin.ft.}$$

R_N - Resultant acts 5.17' above BASE

4b. 1/2 PMF

$$P_{W_{1/2 PMF}} = (h_{1/2} - h_N)(h_N)\,\gamma_w + P_{WN}$$

$$= (939.6-933.0)(933.0-917.5) + \frac{(933-917.5)^2\,62.4}{2}$$

$$= 13.9 \text{ Kips/lin.ft.}$$

$R_{1/2\,PMF}$ - Resultant acts 6.36' above BASE

4c. Full PMF

$$P_{W_{PMF}} = (h_{PMF} - h_N)(h_N)\,\gamma_w + P_{WN}$$

$$= (941.9-933.0)(933.0-917.5)(62.4) + \frac{933-917.5^2\,62.4}{2}$$

$$= 16.1 \text{ Kips/lin.ft}$$

R_{PMF} - Resultant acts 6.54 above BASE

(5) Determine Ice Load (P_I)

$$P_{I\,MAX} = \frac{5000 \text{ psf} \times 2' \text{ deep}}{1000} = 10 \text{ Kips/lin.ft.}$$

$R_{I\,MAX}$ - Resultant acts 14.5' above BASE

$$P_{I\,MIN.} = \frac{5000 \text{ psf} \times 1' \text{ deep}}{1000} = 5 \text{ Kips/lin.ft}$$

$R_{I\,MIN}$ - Resultant acts 15.0' above BASE

(6) Determine Soil Load on Upstream Face

Assume: Active Earth Pressure Conditions

$\phi = 33°$

$K_a = \tan^2(45 - \phi/2)$

$\gamma'_{soil} = 70$ pcf

Wall Friction $\delta = 0$

$\sigma_{h\,max} = K_a \gamma' D_a$

where $D_a = 926. - 917.5 = 8.5'$

$P_a = 1/2\, \sigma_{h\,max} D_a = 1/2\, K_a \gamma' D_a^2$

$= \dfrac{(1/2)(.29)(70)\,8.5^2}{1000} = 0.75$ Kips / lin ft.

R_A = Resultant acts 2.83' above BASE

(7) Determine Passive along Toe (P_p)

Assume: Passive Earth Pressure Condition

$\phi = 33°$

$K_p = \tan^2(45 + \phi/2)$

$\gamma'_{soil} = 70$ pcf

Wall Friction $\delta = 0$

$\sigma_{h\,max} = K_p \gamma' D_p$

where $D_p = 3.3'$

$P_p = 1/2\, \sigma_{h\,max} D_p = 1/2\, K_p \gamma' D_p^2$

$= \dfrac{(1/2)(3.4)(7.0)\,3.3^2}{1000} = 1.3$ Kips / lin ft.

R_p = Resultant acts 1.1' above BASE

(8.) Determine Hydrodynamic Pressure, Force and Moment
(using Zanger Method)

$P_c = c\lambda \gamma_w \sqrt{Zh}$ Max. Pressure at BASE

$V_e = 0.726\ P_e\ Z$ Total Horizontal Force at any elevation below the reservoir

$M_e = 0.299\ P_e\ Z^2$ ······ Total Overturning Moment above elevation Z

For Zone 3 $\lambda = 0.1$

For Vertical Upstream Face at $Z/h = 1.0$ $C = 0.73$

Assume $Z = h$ (Normal Pool at Elev. 933.0)

$P_e = \dfrac{(0.73)(0.1)(62.4)(15.5)}{1000} = .0706$ Ksf / lin ft.

$V_e = 0.726(.0706)1.55 = 0.79$ Kips / lin. ft.

$M_e = 0.299(.0706)15.5^2 = 5.07$ K-ft / lin. ft.

Normal Pool

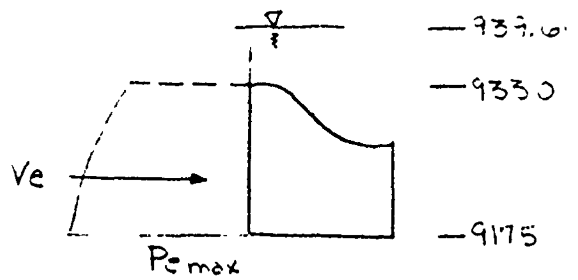
(see page 5A for rest of this section)

(9.) Determine Inertia Force due to Seismic

$P_c = \lambda W_c = (0.1)(31.44\text{ Kips/lin. ft}) = 3.14$ Kips / lin. ft.

R_c = Resultant acts through Centroid, 6.13' above BASE
(15.5 - 9.37 = 6.13')

(10) Determine ½ and Full Uplift Pressures at Normal Pool, ½ PMF and Full PMF
(see Water Force Calculations)



½PMF

$$Pe_{max} = \frac{(0.73)(0.1)(62.4)(22.1)}{1000} = .1007 \text{ Ksf}$$

$$Pe_{@\text{spillway crest}} = \frac{(0.73)(0.1)(62.4)\sqrt{(6.61)(22.1)}}{1000} = .0551$$

$$Ve = 0.726\left[(0.1007)(22.1) - (0.0551)(6.61)\right]$$
$$= 1.61 - .264 = 1.34 \text{ Kips/ft}$$

$$Me = 0.299\,(0.1007)(22.1)^2 - \left(\frac{.299}{.726}h + 15.5\right)(.264)$$
$$= 9.89 \text{ K-ft/ft}$$

Resultant acts 7.38' above BASE

$$Pe_{max} = \frac{(0.73)(0.1)(62.4)(24.4)}{1000} = 0.111 \text{ Ksf}$$

$$Pe_{@\text{spillway crest}} = \frac{(0.73)(0.1)(62.4)\sqrt{(3.9)(24.4)}}{1000} = 0.0671$$

$$Ve = 0.726\left[(0.111)(24.4) - (0.0671)(3.9)\right]$$
$$= 1.97 - 0.43 = 1.54 \text{ Kips/ft}$$

$$Me = 0.299\,(0.111)(24.4)^2 - \left(\frac{.299}{.726}h + 15.5\right)(.43)$$
$$= 19.8 - 8.2 = 11.6 \text{ K-ft/ft}$$

Resultant acts 7.53' above BASE

10a. Normal Pool Uplift

1.) Full Uplift

$$P_{u_N} = \tfrac{1}{2}\,\sigma_{nw}\,L = \tfrac{1}{2}\,\gamma_w\,h_N\,L$$

$$\sigma_{nw} = (\gamma_w)(933 - 917.5)$$

$$L = 22.2$$

$$P_{u_N} = \frac{\tfrac{1}{2}(62.4)(15.5)(22.2)}{1000} = 10.74 \text{ Kips/lin ft.}$$

2) ½ Uplift

$$P_u = \tfrac{1}{2}\left(\frac{\sigma_{nw}}{2}\right)L = \tfrac{1}{4}\,\gamma_w\,h_N\,L$$

$$= \frac{\tfrac{1}{4}(62.4)(15.5)(22.2)}{1000} = 5.37 \text{ Kips/lin. ft.}$$

10b ½ PMF

1) Full Uplift

$$P_{u\,\frac{1}{2}PMF} = \tfrac{1}{2}\,\gamma_w\,h_{\frac{1}{2}PMF}\,L$$

$$= \frac{\tfrac{1}{2}(62.4)(939.6 - 917.5)(22.2)}{1000} = 15.31 \text{ Kips/lin ft.}$$

2.) ½ Uplift

$$= \tfrac{1}{4}\,\gamma_w\,h_{\frac{1}{2}PMF}\,L$$

$$= \frac{\tfrac{1}{4}(62.4)(939.6 - 917.5)(22.2)}{1000} = 7.65 \text{ Kips/lin ft}$$

10c. PMF

1.) Full Uplift

$$P_{u_{PMF}} = \tfrac{1}{2}\,\gamma_w\,h_{PMF}\,L$$

$$= \frac{\tfrac{1}{2}(62.4)(941.9 - 917.5)(22.2)}{1000} = 16.9 \text{ Kips/lin. ft}$$

2) ½ Uplift

$$= \tfrac{1}{4}\,\gamma_w\,h_{PMF}\,L$$

$$= \frac{\tfrac{1}{4}(62.4)(941.9 - 917.5)(22.2)}{1000} = 8.45 \text{ Kips/lin. ft.}$$

R_u = Resultant acts 14.8' from point A

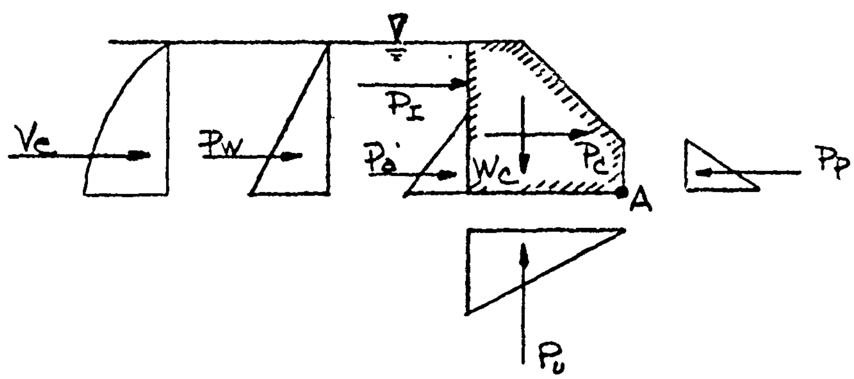
Example Computations:

Normal Pool: with the following loading conditions

A. Full Uplift Force

B. Maximum Ice Load

C. Earthquake



A. Overturning Stability

1.) Overturning Moments

Force	Magnitude (kips)	Moment Arm (ft.)	Moment (Kip-ft)
P_A	0.75	2.83	2.12
P_I	10.0	14.5	145.00
P_c	3.14	6.13	19.25
P_W	7.5	5.17	38.78
V_e	0.79	6.42	5.07
P_u	10.74	14.8	158.95
			$\Sigma M_o = 368.68$

2) Resisting Moments

W_c	31.44	14.56	457.76
P_p	1.30	1.10	1.43
			$\Sigma M_R = 459.19$

$$\boxed{S.F. = \frac{\Sigma M_R}{\Sigma M_o} = \frac{459.19}{368.68} = 1.25}$$

$$X = \frac{\Sigma M_r - \Sigma M_o}{\Sigma F_v} = \frac{459.19 - 368.68}{31.44 - 10.74} = 4.37'$$

$$e = B/2 - \bar{X} = \frac{22.2}{2} - 4.37 = 6.73$$

$$\boxed{B/6 = \frac{22.2}{6} = 3.70 < 6.73}$$

Resultant Outside Middle 1/3 but within base ∴ O.K. for earthquake loading

B Sliding Stability

$$SF_{S-F} = \frac{S_r A + (W_c - P_w)\tan\phi}{\Sigma F_{Horizontal}}$$

Assume: $S_r = 110$ psi

$A = 22.2\ ft^2 = 3196.8\ in^2$

$\phi = 35°$

$$SF = \frac{\frac{(110)(3196.8)}{1000} + (31.44 - 10.74)(0.7)}{0.75 + 10.0 + 3.14 + 7.5 + 0.79 - 1.3} = \boxed{17.5}$$

STABILITY PROGRAM (HP-97)

CALCULATOR PRINT OUT

	RESERVOIR ELEVATION	933.38	***
OVERTURNING MOMENTS	Water Pressure	7.50	***
	Moment Arm	5.2	***
	Hydrostatic Uplift Pressures	3.77	***
	Moment Arm	14.3	***
	Active Earth Pressure	0.75	***
	Moment Arm	2.3	***
	Silt Load	0.00	***
	Moment Arm	0.0	***
	Ice Load	13.03	***
	Moment Arm	14.5	***
	Seismic-Inertial Force	[illegible]	***
	Moment Arm	[illegible]	***
	Seismic-Hydrodynamic Force	0.73	***
	Moment Arm	5.4	***
RESISTING MOMENTS	Weight of Concrete	71.44	***
	Moment	14.6	***
	Passive Earth Pressure	1.38	***
	Moment Arm	1.1	***

Sum of Resisting Moments	459.30	***
Sum of Overturning Moments	[illegible]	***
Safety Factor-Overturning	1.59	***
Eccentricity	4.52	***
Safety Factor-Sliding	17.72	***

Normal Pool 1/2 Uplift	Normal Pool 1/2 Uplift and Ice	Normal Pool 1/2 Uplift and Ice & Earthquake
933.0	933.0	933.0
7.50	7.50	7.50
5.2	5.2	5.2
5.37	5.37	5.37
14.8	14.8	14.8
0.75	0.75	0.75
2.8	2.8	2.8
0.00	0.00	0.00
0.0	0.0	0.0
0.00	10.00	10.00
14.5	14.5	14.5
0.00	0.00	3.14
6.1	6.1	6.1
0.00	0.00	0.79
6.4	6.4	6.4
31.44	31.44	31.44
14.6	14.6	14.6
1.30	1.30	1.30
1.1	1.1	1.1
459.2	459.2	459.2
120.3	265.3	289.62
3.82	1.73	1.59
-1.90	3.65	4.60
53.25	21.83	17.72

Normal Pool Full Uplift	Normal Pool Full Uplift and Ice	Normal Pool Full Uplift and Ice & Earthquake
933.00	933.00	933.00
7.5 5.2	7.5 5.2	7.5 5.2
10.74 14.8	10.74 14.8	10.74 14.8
0.75 2.8	0.75 2.8	0.75 2.8
0.00 0.0	0.00 0.0	0.00 0.0
0.00 14.5	10.00 14.5	10.00 14.5
0.00 6.1	0.00 6.1	3.14 6.1
0.00 6.4	0.00 6.4	0.79 6.4
31.44 14.6	31.44 14.6	31.44 14.6
1.30 1.1	1.30 1.1	1.30 1.1
459.2 199.74	459.2 344.74	459.2 369.06
2.3	1.33	1.24
-1.43	5.57	6.75
52.71	21.61	17.54

1/2 PMF 1/2 UPLIFT	1/2 PMF 1/2 UPLIFT + EARTHQUAKE
939.60	939.60
13.9	13.9
6.4	6.4
7.65	7.65
14.8	14.8
0.75	0.75
2.8	2.8
0.00	0.00
0.0	0.0
0.00	0.00
14.5	14.5
0.00	3.14
6.1	6.1
0.00	1.34
9.1	7.4
31.44	31.44
14.6	14.6
1.30	1.30
1.1	1.1
459.20	459.20
203.74	232.9
2.25	1.97
0.34	1.58
27.58	20.65

PMF ..LL UPLIFT	1/2 PMF FULL UPLIFT + EARTHQUAKE
939.60	939.60
13.9	13.9
6.36	6.36
15.31	15.31
14.8	14.8
0.75	0.75
2.8	2.8
0.00	0.00
0.0	0.0
0.00	0.00
14.5	14.5
0.00	3.14
6.1	6.1
0.00	1.34
9.1	7.38
31.44	31.44
14.6	14.6
1.30	1.30
1.1	1.1
459.20	459.20
317.08	346.25
1.45	1.32
2.29	4.10
27.18	20.35

PMF 1/2 UPLIFT	PMF 1/2 UPLIFT + EARTHQUAKE
941.90	941.90
16.1	16.1
6.54	6.54
8.45	8.45
14.8	14.8
0.75	0.75
2.8	2.8
0.00	0.00
0.0	0.0
0.00	0.00
14.5	14.5
0.00	3.14
6.1	6.1
0.00	1.54
10.0	7.53
31.44	31.44
14.6	14.6
1.30	1.30
1.1	1.1
459.20	459.20
232.47	263.3
1.97	1.74
1.24	2.57
23.65	18.18

PMF FULL UPLIFT	PMF FULL UPLIFT + EARTHQUAKE
941.90	941.90
16.1	16.1
6.54	6.54
16.90	16.90
14.8	14.8
0.75	0.75
2.8	2.8
0.00	0.00
0.0	0.0
0.00	0.00
14.5	14.5
0.00	3.14
6.1	6.1
0.00	1.54
10.0	7.53
31.44	31.44
14.6	14.6
1.30	1.30
1.1	1.1
459.20	459.20
357.53	388.39
1.28	1.18
4.11	6.23
23.27	17.88

APPENDIX E

Available Documents

REPORT ON [illegible] WATER SUPPLY
FOR
VILLAGE OF BROCTON
CHAUTAUQUA COUNTY NEW YORK

AUGUST 1950

Village Board

C. M. Fleming, Mayor

Trustees

Anthony Capellino George Welsbon
Theodore Morse Vernon Jones

Merle Ferguson

Superintendent of Public Works

Nussbaumer and Clarke

Consulting Engineers Buffalo, N. Y.

The principal manufacturing and industrial consumers of water in the Village are:

Pennsylvania Railroad Company
Welch Grape Juice Company
Brocton Furniture Company
Kling Factories
Huntley Manufacturing Company
Brocton Preserving Company, Inc.,

While the population in Brocton up to date has increased at a slow rate, the use of water has increased rapidly due to industrial needs. The details of water production and consumption are given in Sects. 5 and 6.

The Hamlet of Portland, adjacent to the Village on the west, with a population of about 600 persons, desires to obtain a water supply. The only logical place for Portland to obtain water would be from Brocton. If Brocton should decide to funish Portland with water for domestic and fire protection purposes only, the future estimated population of 2500 persons should be ample to cover both communities for some time in the future.

The present source of water supply for Brocton is very limited. Therefore, so long as the present source is retained as the only source of water supply for the Village, no substantial additional consumers of water should be encouraged or permitted to locate in or near the Village where they would be dependent upon the Village system for water.

3. History of Water System

The original water works system of the Village was built in 1897 as a municipal enterprise. The source of water supply was from the south branch of Slippery Rock Creek. A small impounding earth dam was constructed across the south branch of the stream a few hundred feet above the confluence of the south and east branches of the stream, forming what is known as the Burr Reservoir. Another smaller reservoir was built on a tributary stream about 1700 feet below the Burr reservoir to act as a distribution reservoir.

Water from the Burr Reservoir was conducted by means of a 10-inch diameter pipe line to the lower reservoir, then through a 12-inch diameter cast iron pipe line to the distribution system in the Village. The pipe line from the Burr Reservoir to the distribution reservoir was so arranged that the distribution reservoir could be by-passed, and water fed directly to the distribution system from the Burr reservoir. A small brick valve house was located on the 12-inch supply main to the Village about 800 feet below the distribution reservoir. This valve house was later used as a Chlorination station.

The demand for water in the Village soon exceeded the yield of water from the south branch of the stream, so an 8-inch diameter cast iron line was laid from the Burr Reservoir up the east branch of the stream, a distance of about 1400 ft. where a small intake dam was installed so that water could be drawn from the east branch. The dry weather yield from both branches of the stream proved inadequate to meet the demand. In 1916 application was made to the New York State Conservation Commission to divert water from Bear Lake. This application was denied. Therefore, in 1916 application was made to construct a dam on the east branch of Slippery Rock Creek near the site of the small intake structure so as to form an impounding reservoir. on this branch of the stream. The application was approved and the dam was constructed in 1918, forming what is known as the Risley Reservoir.

During the severe drought of the early 1930s the source of supply from Slippery Rock Creek proved to be entirely inadequate, and in 1934 it was necessary for the Village to install a pipe line and a pumping station to pump water from Bear Lake to the Brocton Water Supply to prevent a complete depletion of water stored in the Burr and Risley reservoirs.

In 1934 the consumption of water varied from 200,000 gallons to over 1,000,000 gallons per day, which is practically the same as present day consumption. At that date the greatest consumption was by the food and grape processing companies. It has been stated that during August and September 1934, although the domestic consumption was greatly restricted, the average demand was in excess of 600,000 gallons per day.

In 1934 application was made to the State Water Power and Control Commission for approval of a supplemental supply of water from wells. The application was approved by the Commission so, in 1935, several test wells were drilled. None of the test wells proved satisfactory. After this failure application was made to the commission to install permanent works for pumping water from Bear Lake during periods of drought. The Commission approved the application with the stipulation that the withdrawal of water from Bear Lake should be limited to use as a supplemental supply during periods of drought only, and that the maximum withdrawal should not exceed 1.15 million gallons in any one day. In 1936 or 1937 the Village installed the necessary pipe lines and pumping station to pump water from Bear Lake into the East branch of Slippery Rock Creek above the Risley Reservoir from which point it flows into the reservoir and is drawn off into the water system.

With the advent of the use of water from Bear Lake, which is of poor quality due to its high organic content, and also due to the general complaints of turbid water from Slippery Rock Creek after heavy rains, the Village approved the installation of a filtration plant on the supply system in 1935. This plant was built in 1937 with the aid of a grant under the Federal Public Works Administration. The filtration plant consists of an aerator, mixing chamber, sedimentation basin, two rapid sand filters of

0.3 million gallons daily capacity and a 425,000 gallon filtered water storage basin. After the filtration plant was constructed, the distribution reservoir was abandoned.

The general plan of the Slippery Rock Creek supply system, including the filtration plant and interconnecting piping is shown on Plate III.

In 1942 heavy rains caused the water level of Bear Lake to rise to the point that it overflowed the divide and discharged the flood water into the east branch of Slippery Rock Creek above the Risley reservoir. The flood water eroded the soil along its course, washing out a Town highway, and deposited the bulk of the eroded materials in the Risley reservoir; thereby in a few hours depleting the storage capacity of the reservoir to a point which would have required several years of normal silting from the flood flows of Slippery Rock Creek.

The depletion of the storage capacity of the Risley reservoir, plus the low yield of Slippery Rock Creek during the past few years of drought, makes it imperative that the Village obtain additional storage capacity if the demand of the Village for water is to be met during periods of drought without exceeding the maximum allocation of 1.15 million gallons per day from Bear Lake.

4. Description of Water Supply System

a. Filtration Plant

The water filtration plant is located on the east side of Slippery Rock Creek about 3000 feet north of the Burr Reservoir, which point is about 1 1/2 miles south of the Village of Brocton. The plant was built in 1937. It consists of an aerator, a chemical mixing basin, two coagulation basins, two rapid sand filters, and an underground filtered water storage reservoir of 425,000 gallons capacity. At the standard rate of 2 gallons per minute per square foot of filter surface, the plant has a capacity of 1.2 million gallons per day. The operating level of the filtration plant is at elevation 945.00.

b. Burr Reservoir

The Burr Reservoir is located on the south fork of Slippery Rock Creek about 500 feet south of the confluence of the south fork and east fork of the Creek. The Reservoir is formed by an earth embankment across the valley. The stream has been diverted so that it flows on solid shale rock along the west side of the reservoir and over a fall into the original valley just below the dam. Water is fed from the stream into the reservoir at the upper end of the reservoir. By diverting the course of the stream over the shale bedrock, no spillway is required through the earth embankment.

The reservoir has a rated storage capacity of 8 million gallons. The normal water level in the reservoir is at elevation 972. The south fork of Slippery Rock Creek is spring fed. The terrain of the watershed is such that the stream carries very little silt during freshets. The water is of good quality.

c. Risley Reservoir

The Risley Reservoir is located on the east branch of Slippery Rock Creek about 1700 feet above the confluence of the south fork and east fork of the Creek. This point is about 1400 feet east of the Burr Reservoir. The location of the reservoir is shown on Plate I and III.

The reservoir is formed by a dam built across the valley of the stream. The dam is of earth with a concrete core wall and concrete spillway. The earth embankment and core wall is 225 feet in length and 37 feet in height measured from the low point in the valley to the top of the dam. The spillway is on the south end of the dam. It is 50 feet in width measured along the center line of the dam. The spillway effluent channel curves with the contour of the side of the valley and discharges into the stream just below the toe of the dam. A 10-inch diameter cast iron outlet pipe line located at about the mid point of

the dam, extends from a concrete inlet chamber at the toe of inside slope to a concrete chamber located at the toe of the outside slope. A valve in a concrete valve chamber is located in the center of the dam. An 8-inch diameter cast iron supply line from the dam is connected to the 16-inch diameter outlet in the outlet chamber at the outside toe of the dam.

The original overflow elevation of the spillway was 1032.87. The height of crest of the spillway has been raised 13-inches in recent years. Therefore, the present overflow elevation of the spillway is 1033.95. The top of the dam is at elevation 1038.0.

The original storage capacity of the reservoir is reputed to have been 16 million gallons. Using the original contour map of the reservoir and the present crest of the spillway, we compute the original storage capacity to be 14.5 million gallons. The present storage capacity is estimated to be 3 million gallons. Therefore, silt deposited in the reservoir area has depleted the storage capacity by 11.5 million gallons, or 79 percent. We estimate that 61,000 cubic yards of material will have to be removed from the reservoir area to restore it to its original capacity.

d. Supply Pipe Lines

On Plate III is shown the locations of the Filtration Plant, the Burr Reservoir, the Risley Reservoir and the connecting pipe lines.

As will be noted on Plate II, the pipe lines are so connected that water from the Risley Reservoir can be fed into the Burr Reservoir, then from the Burr Reservoir to the Filtration Plant, or it can be fed directly to the Filtration Plant from either the Burr or Risley Reservoirs.

The normal pool level of the Risley Reservoir is 62 feet higher than normal pool level of the Burr Reservoir, and the Burr Reservoir is 27 feet higher than the operating level of the Filtration plant. There is approximately

Total Storage Required (180 days x 500,000 gallons)		90 Million Gallons
Present Storage:		
Burr Reservoir	8 Million Gallons	
Risley Reservoir (After Cleaning)	14 " "	
Total Present Storage		22 Million Gallons
Additional Storage Required		68 Million Gallons

3. Proposed New Reservoir

The only place where a reservoir of the capacity required could be located so that it could be integrated into the present water supply system is on Slippery Rock Creek just above the filtration plant. Then, water from the reservoir would have to be pumped into the filtration plant to be utilized.

A plan of a proposed dam and the reservoir formed by it is shown on Plate IV. The dam indicated will impound approximately 69,000,000 gallons of water. This is about equal to the estimated minimum storage required. Since the minimum storage required was based on a duration of time when the rainfall is less than 2-inches per month, no allowance has been made for evaporation from the surfaces of the reservoirs, because there would be sufficient flow in the stream to more than offset the evaporation that would occur.

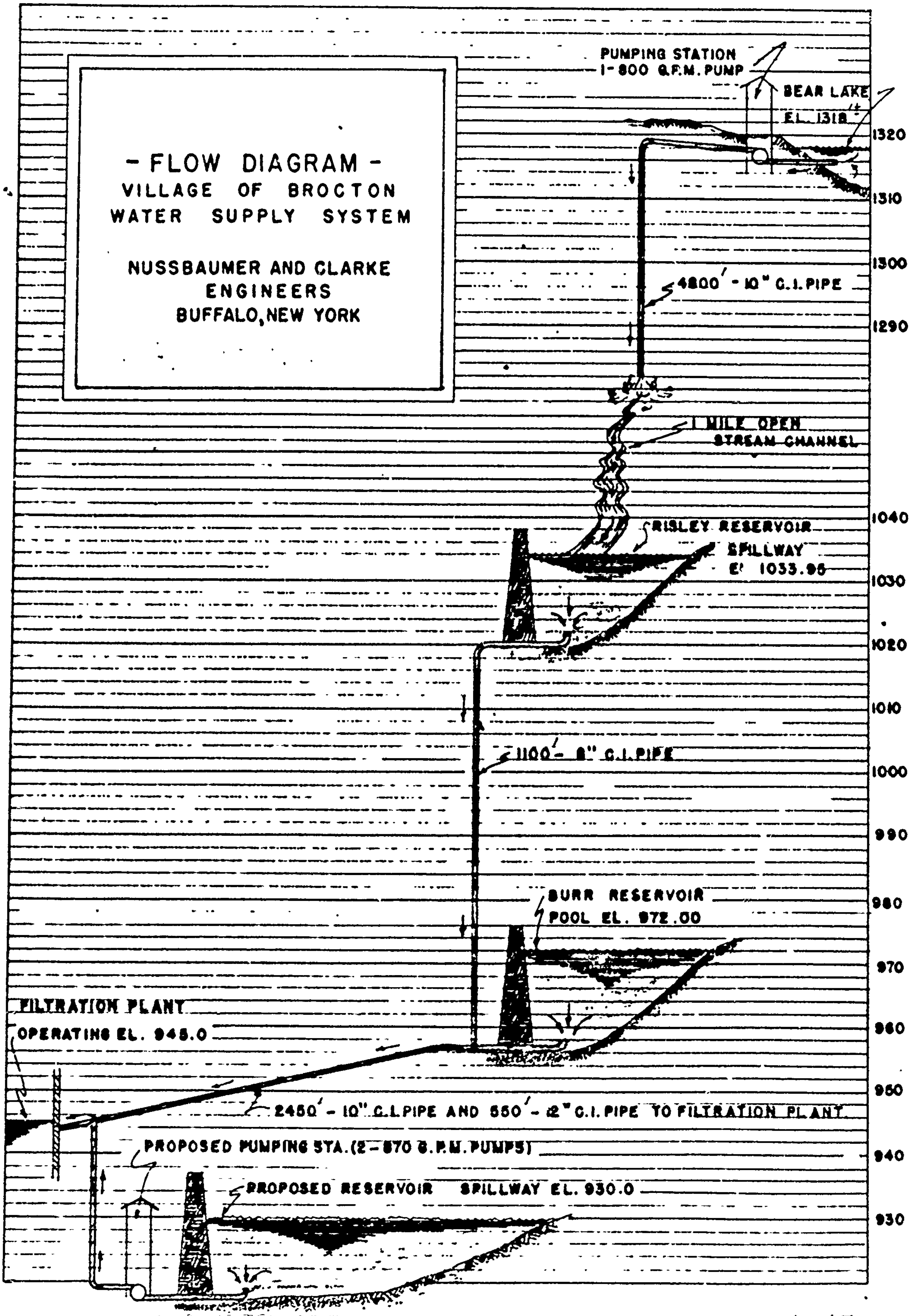
The dam indicated on Plate IV. would have a maximum height of 43 feet, with a freeboard above spillway crest of 7 feet. The spillway would be 50 feet in width, measured along the center line of the dam. With a width of 50 feet and a depth of 6.5 feet the spillway would be capable of passing

TOPOGRAPHIC MAP
VICINITY OF
BROCTON, NEW YORK
NUSSBAUMER AND CLARKE - CONSULTING ENGINEERS - BUFFALO, NEW YORK

Scale 1 62,500

1 1/2 0 1 2 3 Miles

PLATE II



- FLOW DIAGRAM -
VILLAGE OF BROCTON
WATER SUPPLY SYSTEM
NUSSBAUMER AND CLARKE
ENGINEERS
BUFFALO, NEW YORK
PUMPING STATION
1-800 G.P.M. PUMP
BEAR LAKE
EL. 1318
4800' - 10" C.I. PIPE
1 MILE OPEN
STREAM CHANNEL
RISLEY RESERVOIR
SPILLWAY
EL 1033.96
1100' - 8" C.I. PIPE
BURR RESERVOIR
POOL EL. 972.00
FILTRATION PLANT
OPERATING EL. 945.0
2450' - 10" C.I. PIPE AND 550' - 12" C.I. PIPE TO FILTRATION PLANT
PROPOSED PUMPING STA. (2 - 870 G.P.M. PUMPS)
PROPOSED RESERVOIR SPILLWAY EL. 930.0
1320
1310
1300
1290
1040
1030
1020
1010
1000
990
980
970
960
950
940
930

Form E-61. 3-24-47-500 (CL C71)
ORD. 7-05-36

STATE OF NEW YORK

DEPARTMENT OF PUBLIC WORKS

RECEIVED
DEP. ... NO.
JUN 29 1951
FLOOD CONTROL
CANALS
RFD TO......

ALBANY

Received June 29, 1951 Dam No. 3-1524

Disposition Approved July 30, 1951 Watershed Lake Erie

Foundation inspected

Structure inspected

Application for the Construction or Reconstruction of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N. Y., in compliance with the provisions of Section 948 of the Conservation Law (see third page of this application) for the approval of specifications and detailed drawings, marked Village of Brocton, New York Storage Reservoir Project herewith submitted for the { construction ~~reconstruction~~ } of a dam herein described. All provisions of law will be complied with in the erection of the proposed dam. It is intended to complete the work covered by the application about November 1, 1951
(Date)

1. The dam will be on Slippery Rock Creek flowing into Lake Erie in the town of Portland County of Chautauqua and is 1.6 mi. south from intersection of State Route 380 and U. S. Route 20
(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)

2. Location of dam is shown on the Dunkirk quadrangle of the United States Geological Survey.

3. The name of the owner is Village of Brocton, New York

4. The address of the owner is Village Hall, Brocton, New York

5. The dam will be used for Storage Reservoir, Water Supply System

6. Will any part of the dam be built upon or its pond flood any State lands? No

7. The watershed above the proposed dam is 3.74 square miles.

8. The proposed dam will create a pond area at the spillcrest elevation of 16 acres and will impound 10,700,000 cubic feet of water.

FORM B. & G. C-7-A-1. 6-26-50-20M (8-287)
ORD. HC CC 165-3-05-38

Subject Village of Brockton

Sheet No.

Total No. Sheets

Date

Watershed Area 3.74 Sq. Mi. (2390 Acre) o.k. by Scaling

Run-off

$Q = AIR$

$A = 2390$

$I = .2$ (Assumed)

$R = 4.5$ (Govt. chart)

$Q = 2390 \times .2 \times 4.5 = 2150$ c.f.s.

Burkli-Ziegler

$q = cr \sqrt[4]{\frac{S}{a}}$

$c = .31$

$r = 4.5$

$S = 125$ ft. per ~~1000~~

$a = 2390$

$q = .31 \times 4.5 \sqrt[4]{\frac{125}{2390}} = .67$

$Q = .67 \times 2390 = 1600$ c.f.s.

Spillway 60' long x 7' high

Capacity = 65 c.f.s. per ft. of length chart in [illegible]

" = $60 \times 65 = 3900$ c.f.s.

" = $.60 \times \frac{2}{3} \times bh\sqrt{2gh}$ (Henry Ryan)

" = $.6 \times \frac{2}{3} \times 60 \times 7 \sqrt{2 \times 32 \times 7} = 3550$ c.f.s.

" as per application = 3700 Say c.f.s.

Computed by ... Date

Checked by

FORM B. & G. C-7-A-1. 6-28-30-20M (B-297)
ORD. HC CC 105-3-05-38

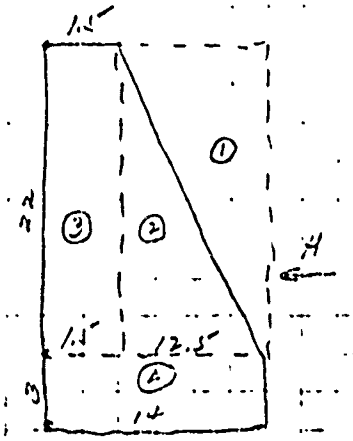
Subject Village of Brockton

Sheet No.

Total No. Sheets

Date

Wing Wall at Spillway (Section 3-3)



		Weight	Arm	Mom.
① 22 x 6.25 x 100	=	13750	4.17	57300
② 22 x 6.25 x 150	=	20600	8.34	172000
③ 22 x 1.5 x 150	=	4950	13.25	65500
④ 3 x 14 x 150	=	6300	7.0	44000
$H = 5 \times 21^{-3}$	=			78100
		45600	9.13	416900

$\frac{9.13}{14} = 65.370$ ok. rock

$e = 9.13 - 7 = 2.13$

Max. Pressure $\frac{45600}{14}\left(1 + \frac{6 \times 2.13}{14}\right) = 6200$ #/□' ok Rock

.91

Computed by G. K. Date

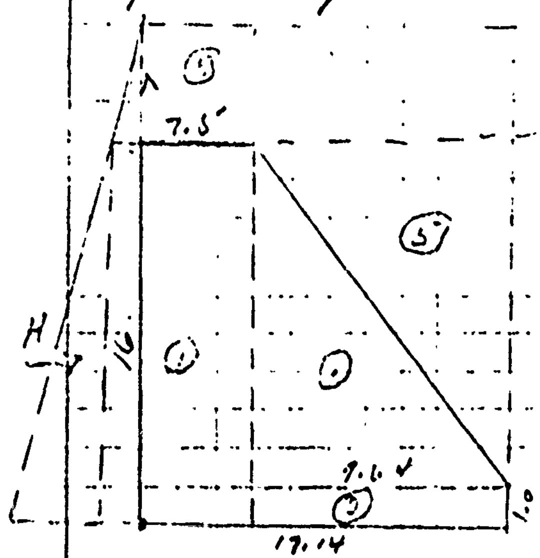
Checked by Date

FORM B. & G. C-7-A-1. 6-28-30-20M (8-237)
ORD. HC CC 165-3-05-38

Subject [illegible]

Sheet No. .... Total No. Sheets .... Date ....

Spillway



Sliding

P = 5

	Wt.	Arm	Mom
① 16 × 7.5 × 150	18000	3.75	67500
② 15 × 4.82 × 150	11850	10.71	127000
③ 1 × 9.64 × 150	1450	12.32	17900
④ 7 × 17.14 × 62.5	7500	8.57	64200
⑤ 15 × 4.82 × 62.5	4500	13.93	63000

$H = 10.5 \times 16^3 + 16 \times 62.5 =$ 41000

Case I Water at Flood 43300 8.85 383600

e = 8.85 − 8.57 = say 0 Max. Press = 43300 ÷ 17.14 = 2530 #/□'

Case II No Water 31300 6.8 212400

e = 8.57 − 6.8 = 1.77

$$\text{Max. Pressure} = \frac{31300}{17.14}\left(1 + \frac{6 \times 1.77}{17.14}\right) = 2800\ \#/\square' \text{ on Rock}$$

Computed by .... Date ....

Checked by .... Date ....

Sanitary *Civil* *Structural*

GEORGE W. NUTBROWN
CONSULTING ENGINEER
WEST LAKE ROAD WESTFIELD, N. Y. 14787
PHONE 716-326-3814

REPORT ON WATER SUPPLY

for

VILLAGE OF BROCTON

CHAUTAUQUA COUNTY, NEW YORK

February 1967

to

VILLAGE BOARD

Jay Olsen - Mayor

2.22 Location
The pumping station is located about 400 feet off the highway that runs along the east shore of the Lake, and about 400 feet north of the north end of the Lake. A twelve inch diameter cast iron suction pipe extends from the pumping station out into the Lake for about 200 feet where it terminates in a submerged concrete intake box. A ten inch diameter cast iron discharge line extends from the pumping station parallel with the Lake Road, a distance of about 4800 feet where it terminates in a concrete chamber on the east fork of Slippery Rock Creek. The discharge chamber is so constructed as to prevent siphoning from Bear Lake when the pump is not running.

2.23 Equipment
The pumping station consists of a concrete pump pit with a brick superstructure housing one Fairbanks-Morse 750 g.p.m. centrifugal pump. The pump is driven by 1750 r.p.m., 10 h.p., 1 phase, 60 cycle, 220 volt motor. A sparling vane type meter, located in the pumping station, measures and records the amount of water being drawn from the Lake.

2.24 Aeration
Bear Lake is shallow with considerable area of low swampy land surrounding the Lake proper, with the result that the water of the Lake is high in organic matter and deficient in oxygen, requiring aeration of the water to make it potable. For this reason the water pumped from the Lake is discharged into Slippery Rock Creek about 0.9 miles above the Risl , Reservoir instead of being piped to the effluent line of the Risley Reservoir.

3.0 Storage Facilities

3.1 Risley Reservoir
The Risley Reservoir is located on the east branch of Slippery Rock Creek about 1700 feet above the confluence of the south fork and east fork of the Creek. This point if about 1400 feet east of the Burr Reservoir. The reservoir is formed by a dam built across the valley of the stream. The dam is of earth with a concrete core wall and concrete spillway. The earth embankment and core wall is 225 feet in length and 37 feet in height measured from the low point in the valley to the top of the dam. The spillway is on the south end of the dam. It is 50 feet in width,

along the centerline of the dam. The spillway discharges into the creek approximately 200 feet below the toe of the dam. The dam impounds a reservoir of 18.1 acres with the water at crest elevation 933.0 and has a maximum storage capacity of 84 million gallons. With a draft of 13 feet, or at elevation 920.0, the surface area at the reservoir is reduced to 8.5 acres and stores 20 million gallons.

4.0 Supply Pipe Lines and Pumping Station

4.1 Risley Reservoir and Burr Reservoir

The pipe lines are so connected that water from the Risley Reservoir can be fed into the Burr Reservoir, then from the Burr Reservoir to the Filtration Plant, or it can be fed directly to the Filtration Plant from either the Burr or Risley Reservoirs. The normal pool level of the Risley Reservoir is 62 feet higher than normal pool level of the Burr Reservoir, and the Burr Reservoir is 27 feet higher than the operating level of the Filtration Plant. There is approximately 1400 linear feet of eight inch diameter cast iron pipe connecting the Risley Reservoir into the outlet piping from the Burr Reservoir, and 2600 linear feet of ten inch diameter and 560 feet of twelve inch diameter cast iron pipe conducting the water from the Burr Reservoir to the Filtration Plant.

4.2 New Reservoir

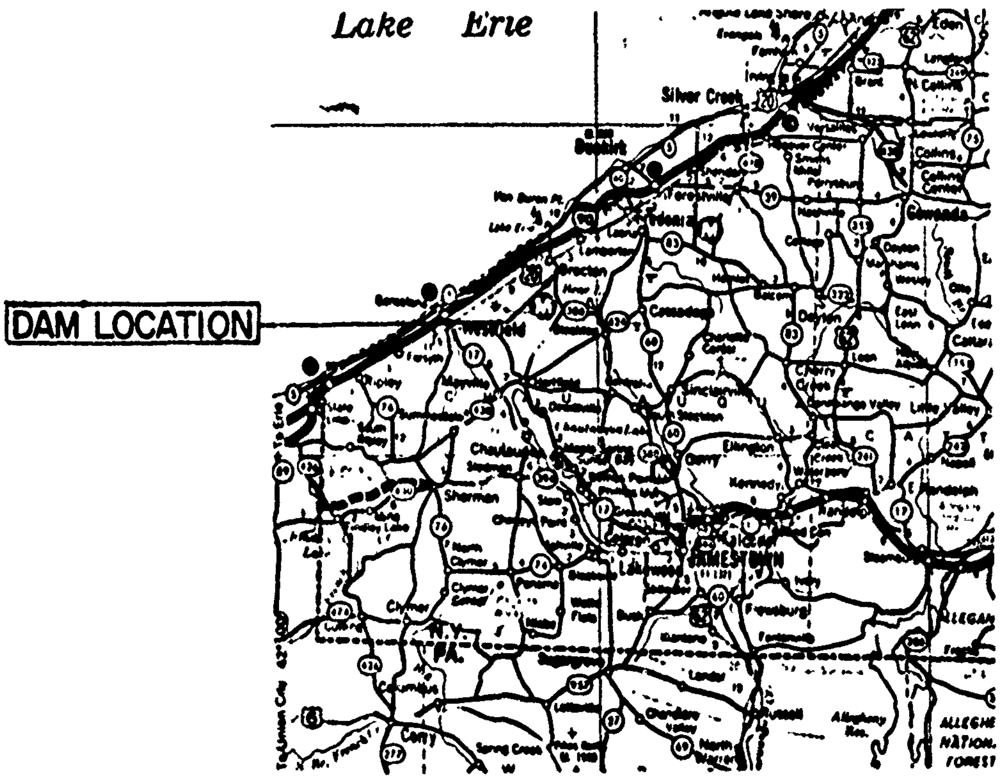
Water from the new reservoir is supplied from a pumping station located at the toe of the dam. Two pumps, one rated at 10 h.p. and the other at 7½ h.p., lift the water from elevation 895 to the filter plant at elevation 945 against a head of 50 feet. Pump capacities are as follows: 7½ h.p. rated at 720,000 gallon per day and the 10 h.p. rated at 1,000,000 gallon per day. The water is conducted from the reservoir to the pumping station thru a ten inch cast iron suction pipe. Then it is pumped into the existing ten inch cast iron line from Burr Reservoir to a twelve inch cast iron line at the toe of the hill below the filter plant. The twelve inch cast iron pipe then conducts the water up the embankment to the Filter Plant.

4.3 Village Supply Pipe

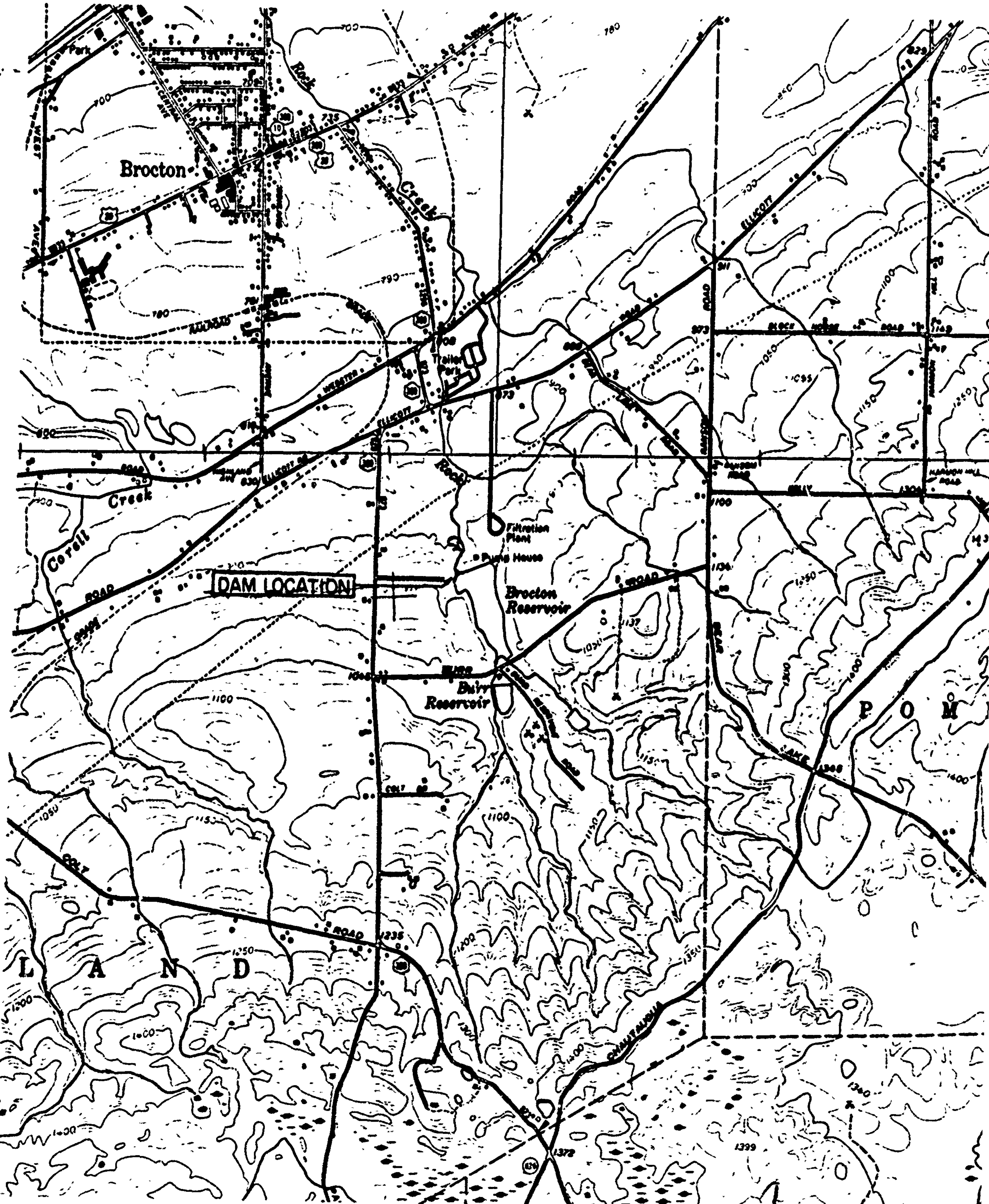
The supply main from the Filtration Plant to the Village is a twelve inch diameter cast iron pipe. The distance from the Plant to the center of the Village is about 1.8 miles.

APPENDIX F

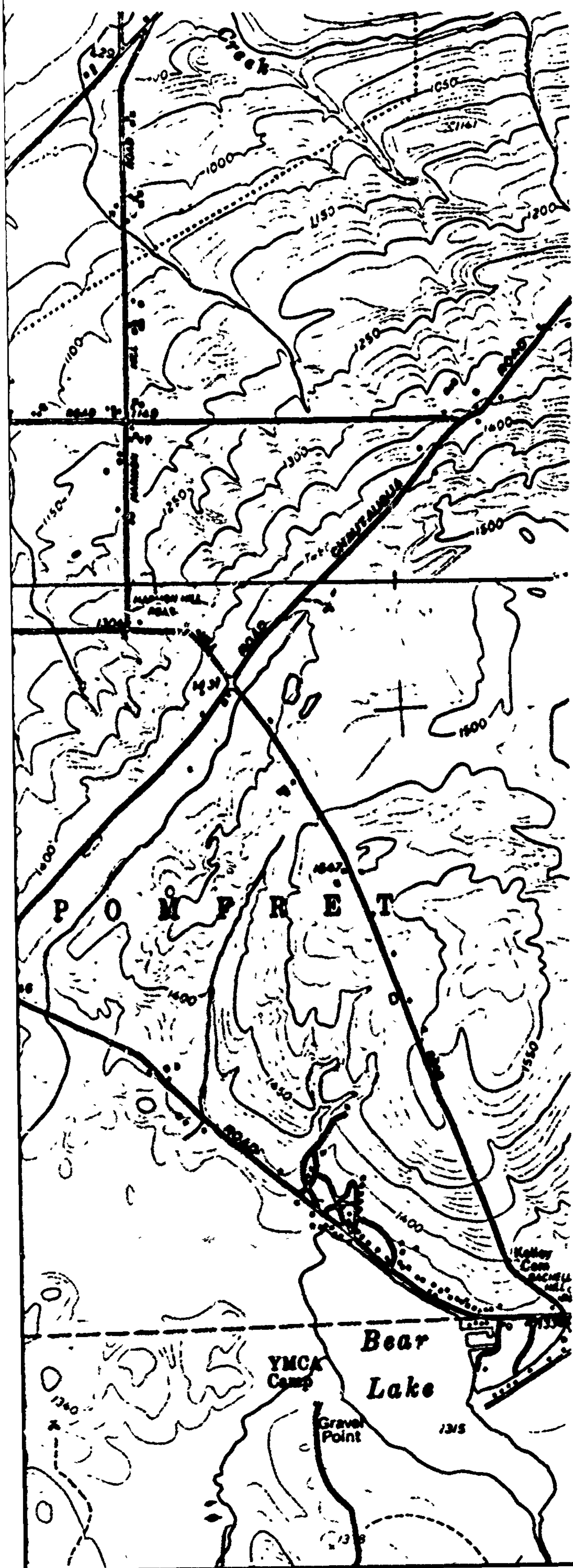
DRAWINGS



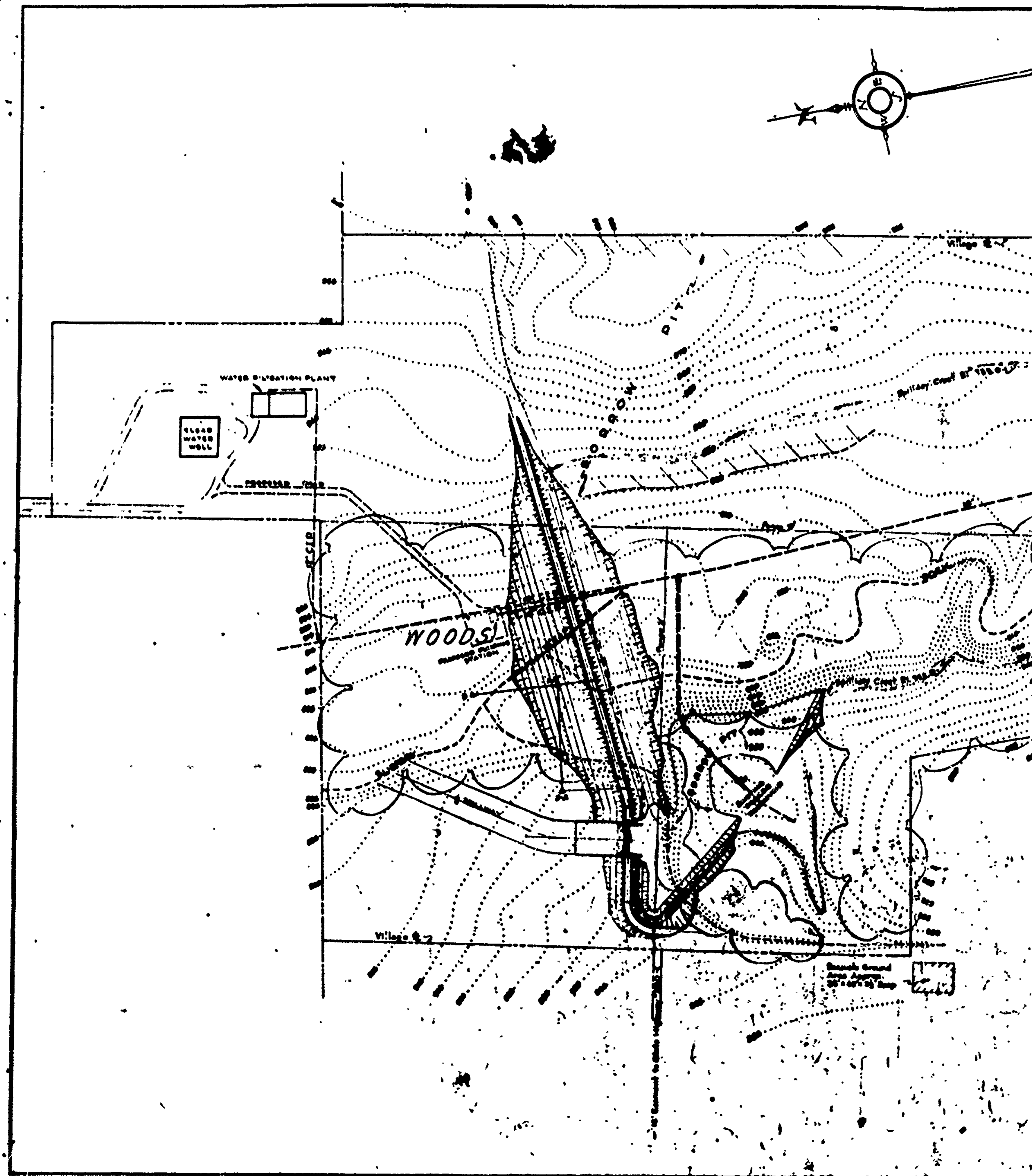
VICINITY MAP
BROCTON RESERVOIR
I.D. NO. N.Y. 785

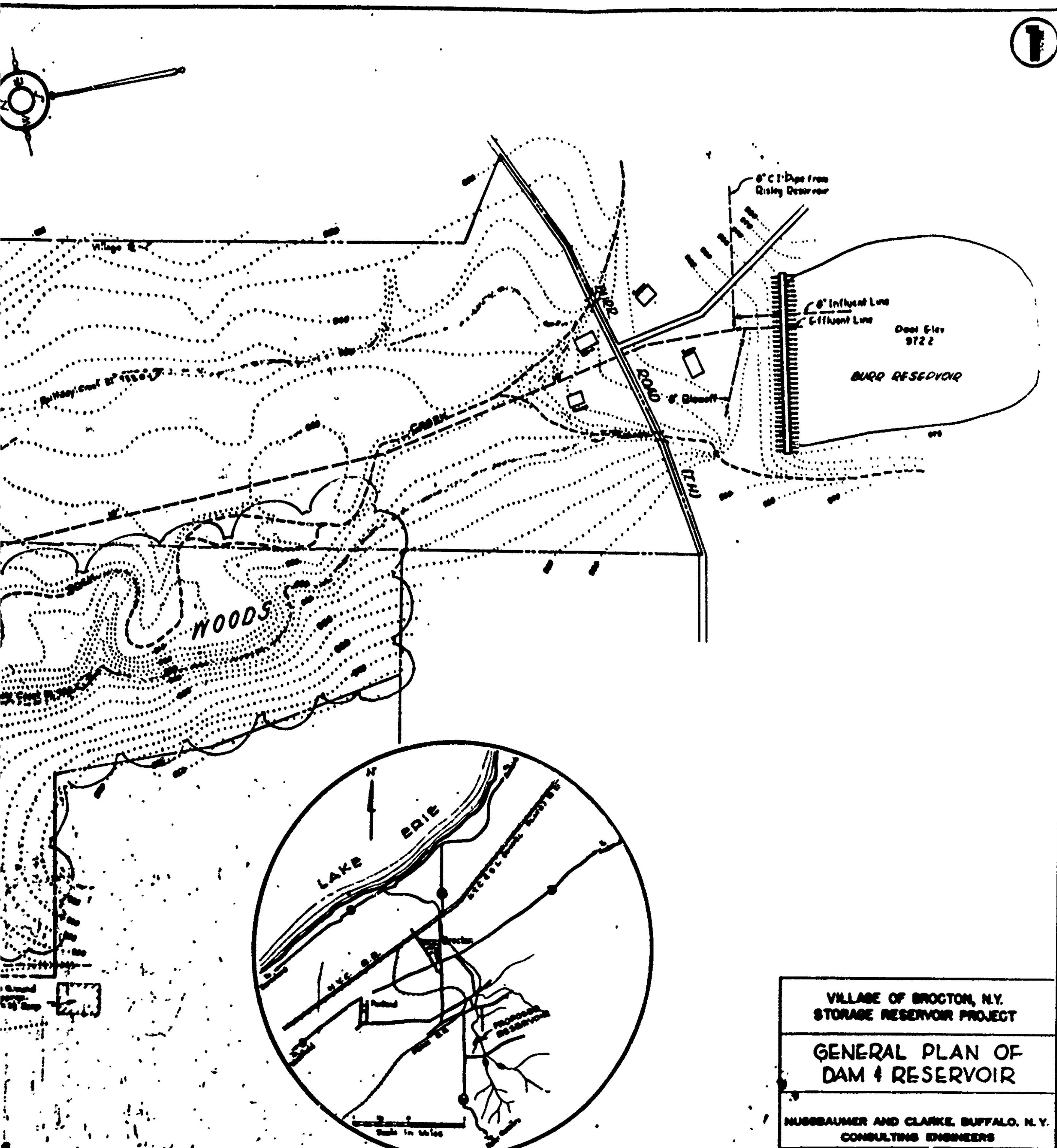


Brocton
Trailer Park
Filtration Plant
Pump House
DAM LOCATION
Brocton Reservoir
Burr Reservoir
Covell Creek
Rock Creek
ELLICOTT
CHAUTAUQUA
L A N D
P O M



TOPOGRAPHIC MAP
BROCTON RESERVOIR
I.D. NO. N.Y. 785


WATER FILTRATION PLANT
CLEAR WATER WELL
WOODS



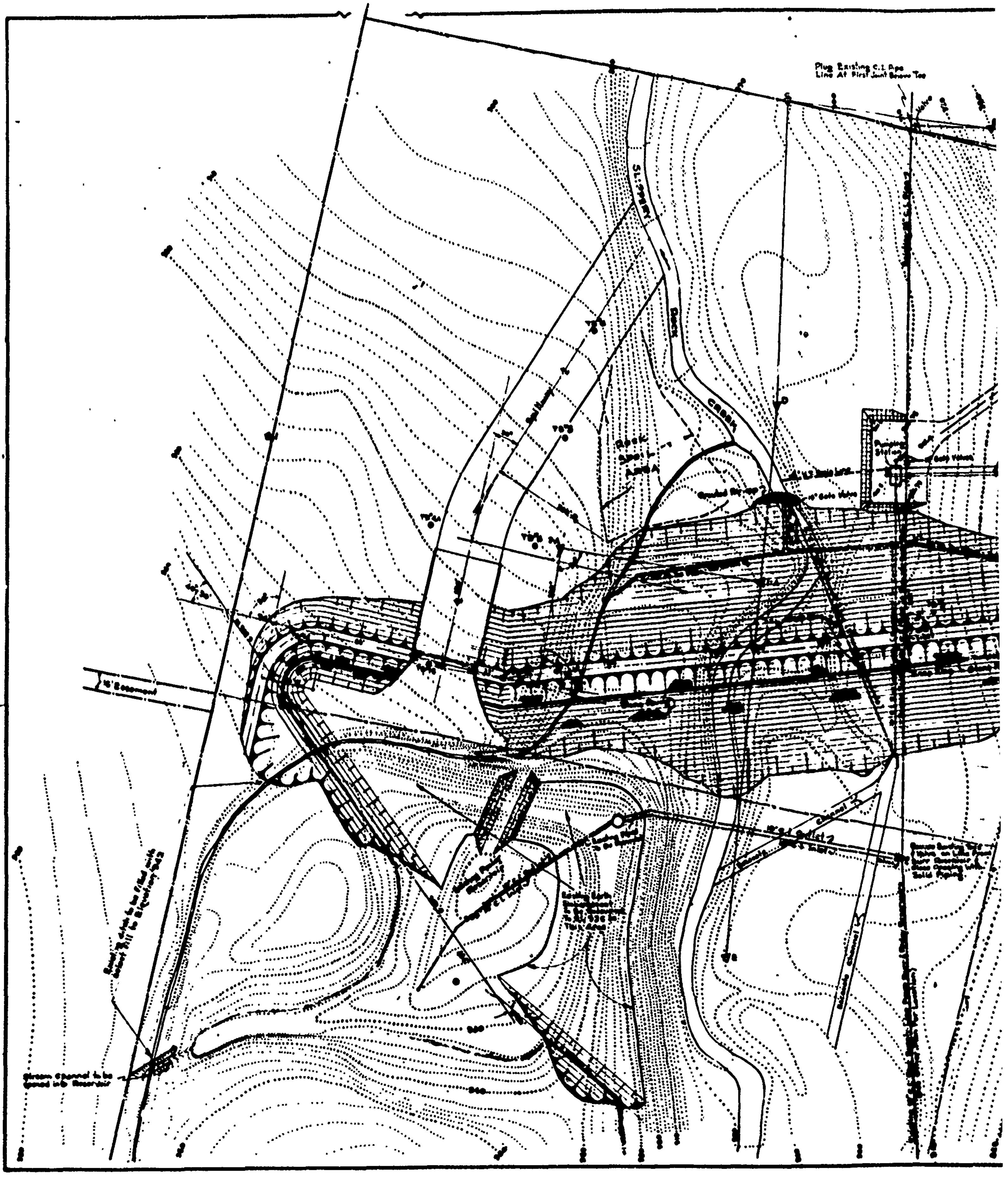
Location Plan

VILLAGE OF BROCTON, N.Y.
STORAGE RESERVOIR PROJECT

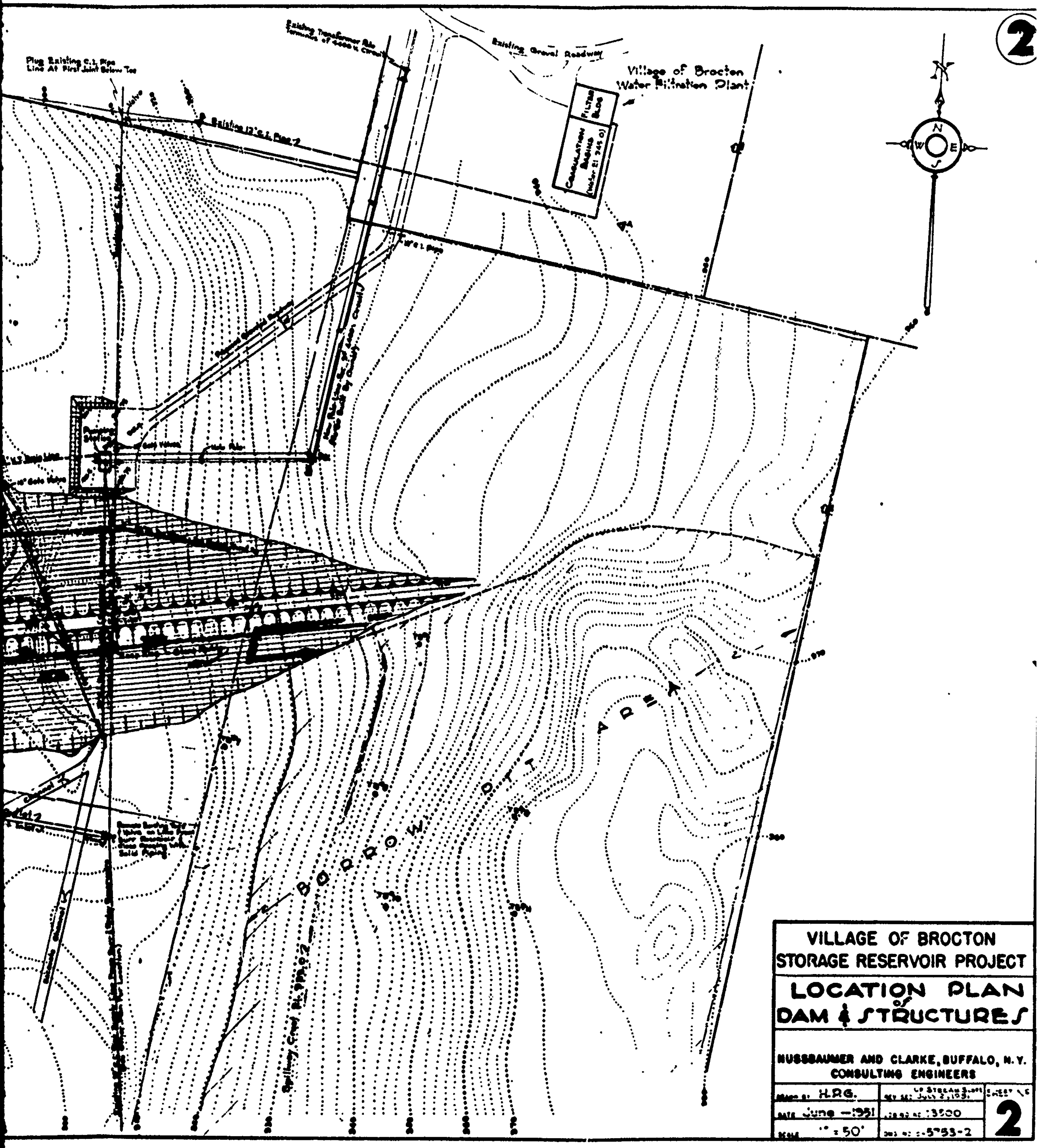
GENERAL PLAN OF
DAM & RESERVOIR

NUSSBAUMER AND CLARKE, BUFFALO, N.Y.
CONSULTING ENGINEERS

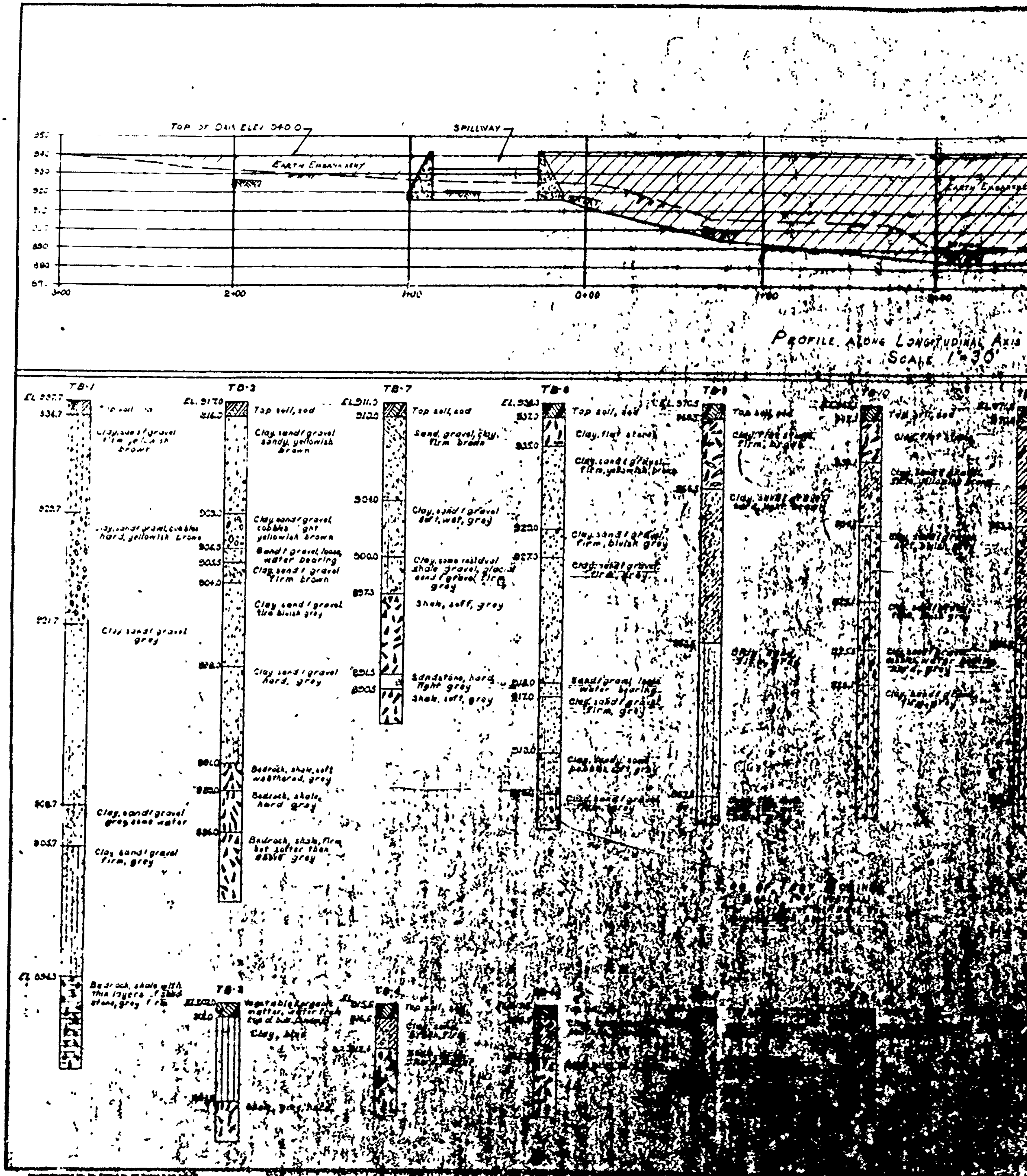
R.E.Y.-H.R.G.	JULY 21, 1951	SHEET 1
DATE JUNE - 1951	K-13500	
SCALE 1" = 100'	C-5753-1	



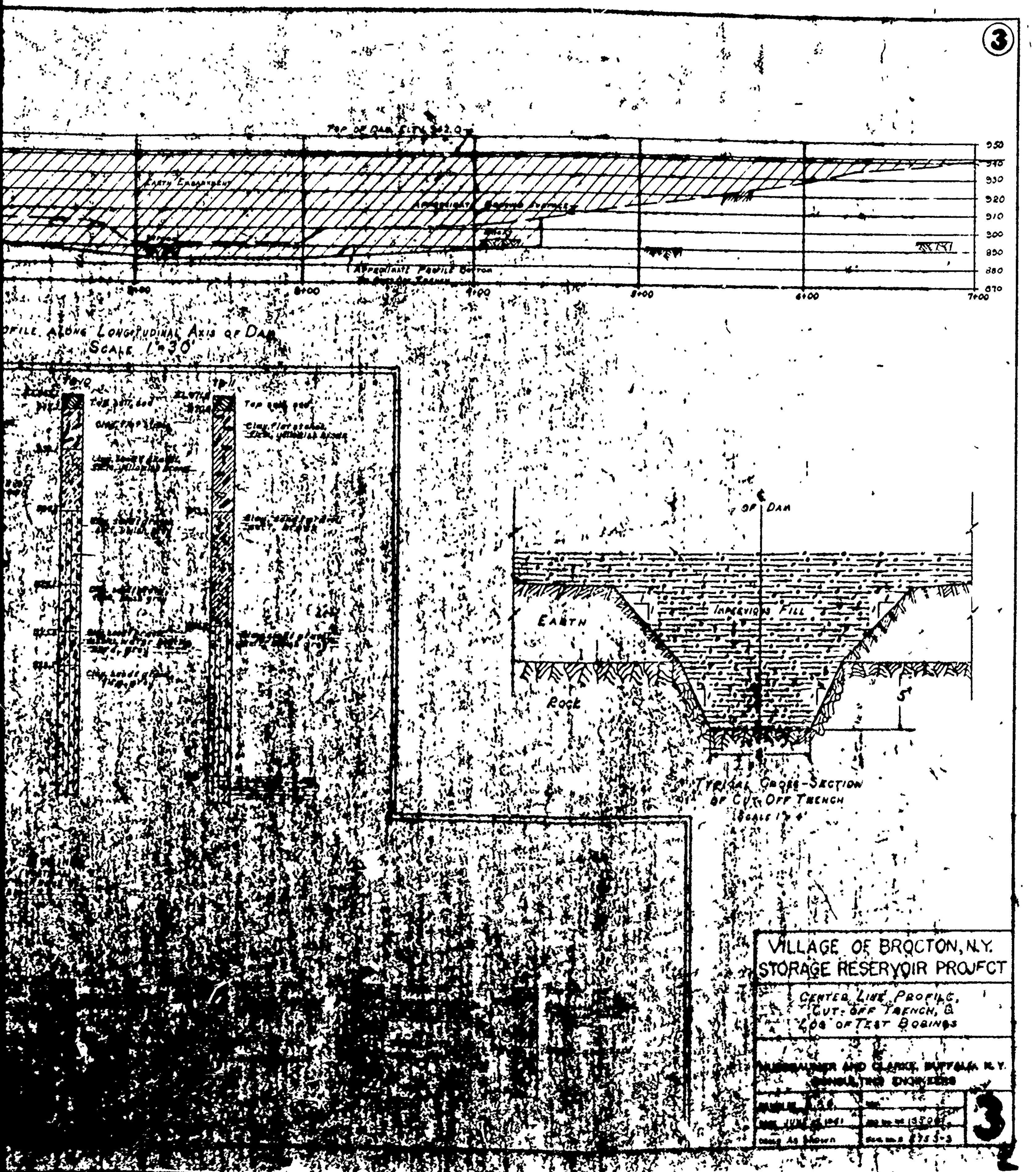
Plug Existing C.I. Pipe
Line At First Joint Below Tee
CREEK
Rock
Spoil
Area
5' Easement
Stream Channel to be
Graded into Reservoir

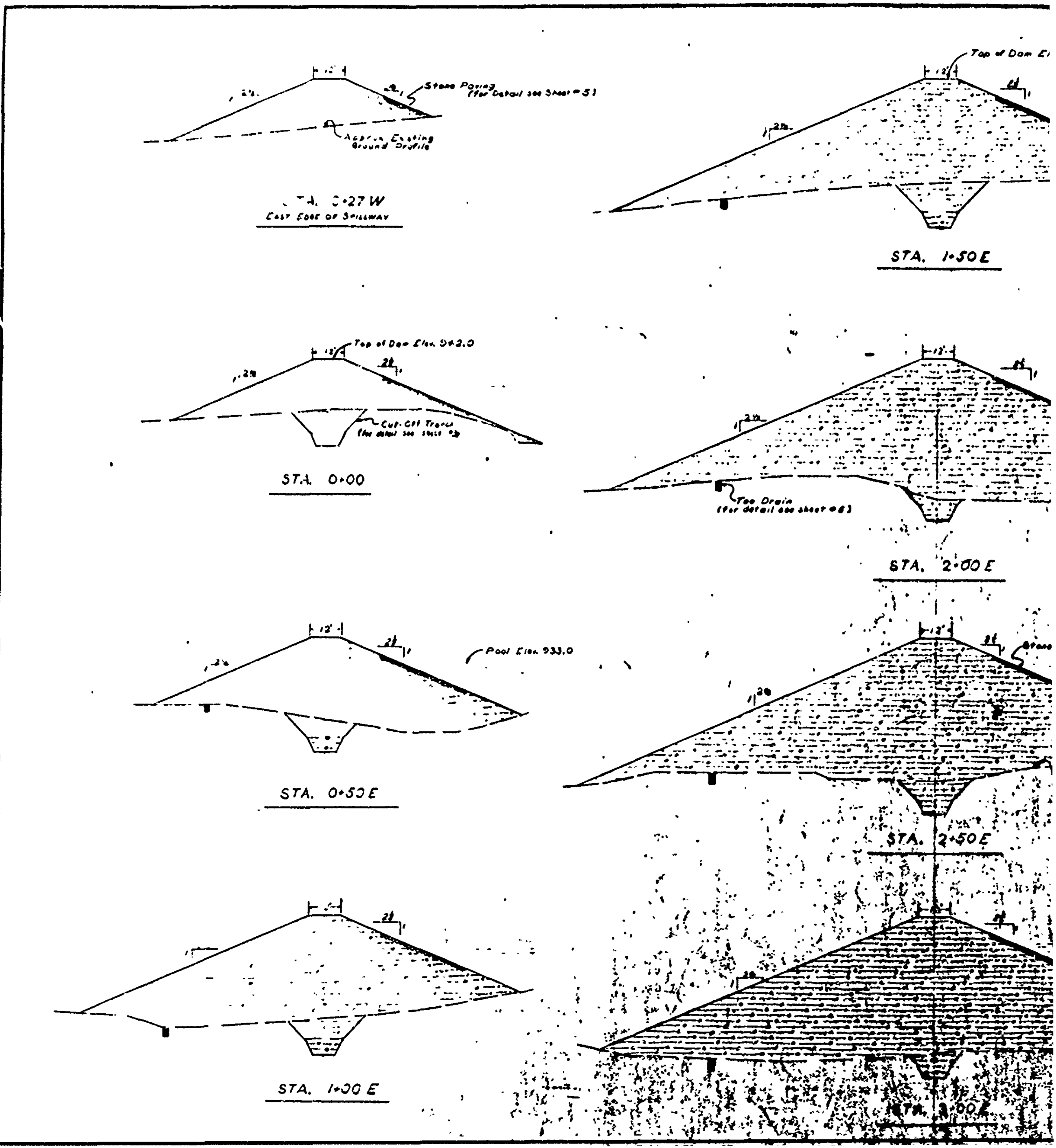


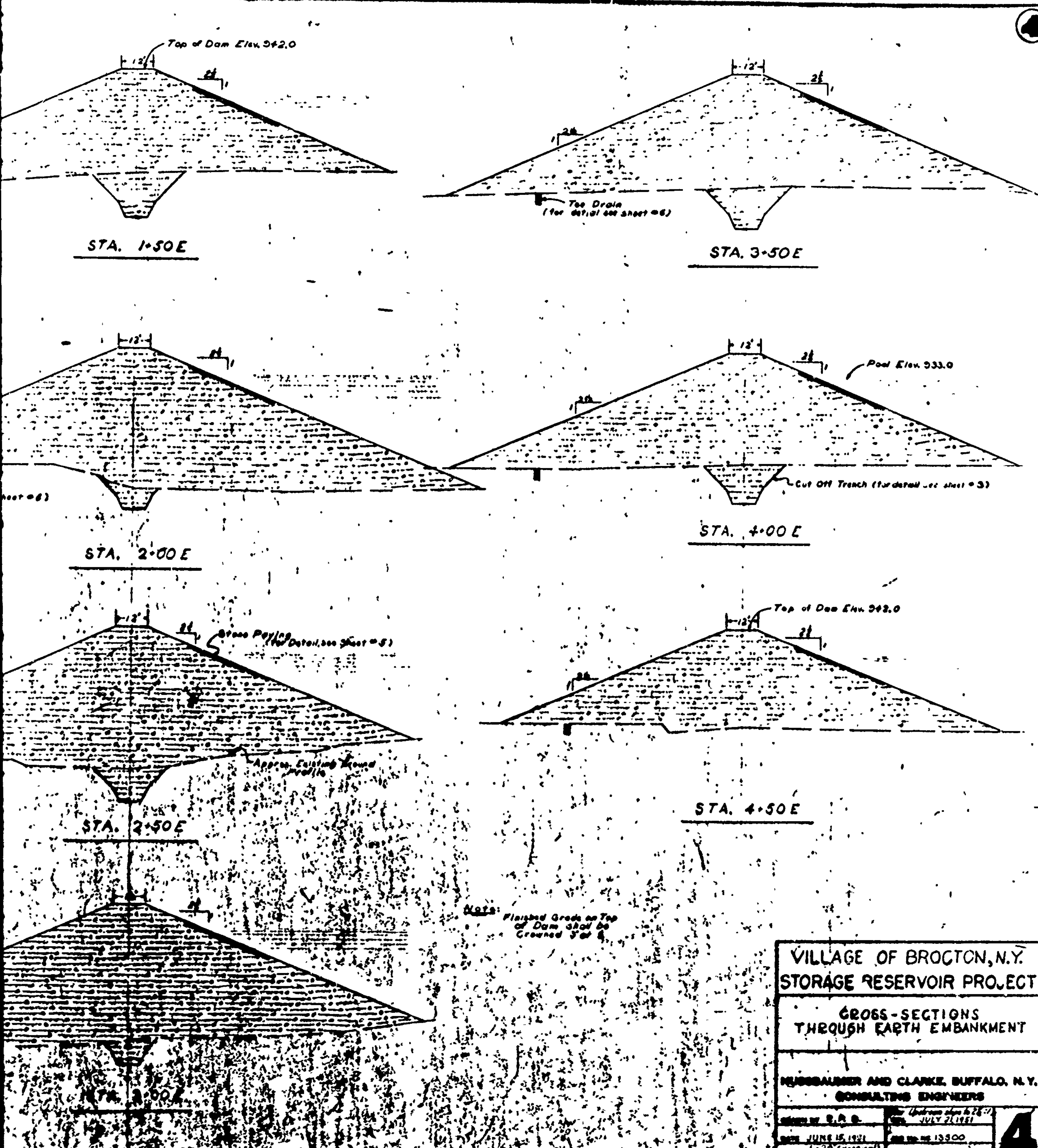
Existing Gravel Roadway
Village of Brocton
Water Filtration Plant
FILTER BLDG.
COAGULATION BASINS
Plug Existing C.I. Pipe
Line At First Joint Below Tee
Existing 12" C.I. Pipe
N
W
E
S
BORROW PIT AREA
VILLAGE OF BROCTON
STORAGE RESERVOIR PROJECT
LOCATION PLAN of DAM & STRUCTURES
NUSSBAUMER AND CLARKE, BUFFALO, N.Y.
CONSULTING ENGINEERS
H.R.G.
June - 1951
1" = 50'
2



TOP OF DAM ELEV 940.0
SPILLWAY
EARTH EMBANKMENT
3+00
2+00
1+00
0+00
PROFILE ALONG LONGITUDINAL AXIS
SCALE 1"=30'
TB-1
Top soil, sod
Clay, sand & gravel firm, yellowish brown
Clay, sand & gravel, cobbles hard, yellowish brown
Clay, sand & gravel grey
Clay, sand & gravel grey, some water
Clay, sand & gravel firm, grey
Bedrock, shale with thin layers of sandstone, grey, firm
TB-3
Top soil, sod
Clay, sand & gravel sandy, yellowish brown
Clay, sand & gravel, cobbles light yellowish brown
Sand & gravel, loose, water bearing
Clay, sand & gravel firm brown
Clay, sand & gravel firm bluish grey
Clay, sand & gravel hard, grey
Bedrock, shale, soft weathered, grey
Bedrock, shale, hard grey
Bedrock, shale, firm but softer than above grey
TB-7
Top soil, sod
Sand, gravel, clay, firm brown
Clay, sand & gravel soft, wet, grey
Clay, some residual shale gravel, glacial sand & gravel, firm grey
Shale, soft, grey
Sandstone, hard, light grey
Shale, soft, grey
TB-8
Top soil, sod
Clay, flat stones
Clay, sand & gravel firm, yellowish brown
Clay, sand & gravel firm, bluish grey
Sand & gravel, loose water bearing
Clay, sand & gravel firm, grey
TB-9
Top soil, sod
TB-2
Vegetable & organic matter, water from top of hole
Clay, blue
Shale, grey, hard
TB-4
Top soil, sod


3
950
940
930
920
910
900
890
880
870
6+00
7+00
EARTH EMBANKMENT
OFILE ALONG LONGITUDINAL AXIS OF DAM
SCALE 1"=30'
℄ OF DAM
IMPERVIOUS FILL
EARTH
ROCK
5'
TYPICAL CROSS-SECTION
OF CUT OFF TRENCH
VILLAGE OF BROCTON, N.Y.
STORAGE RESERVOIR PROJECT
CENTER LINE PROFILE,
CUT-OFF TRENCH, &
LOG OF TEST BORINGS
AS SHOWN
3


STA. 0+27 W
East Edge of Spillway
Stone Paving (for Detail see Sheet #5)
Approx. Existing Ground Profile
STA. 1+50 E
Top of Dam El.
Top of Dam Elev. 942.0
Cut-Off Trench (for detail see sheet #3)
STA. 0+00
Toe Drain (for detail see sheet #6)
STA. 2+00 E
Pool Elev. 933.0
STA. 0+50 E
STA. 2+50 E
STA. 1+00 E
STA. 3+00 E



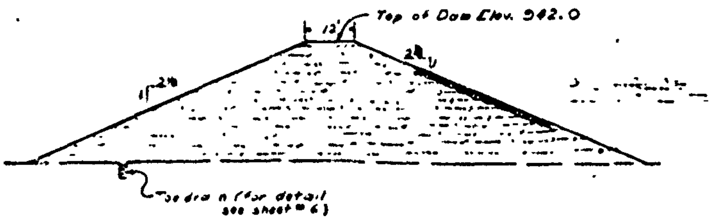
VILLAGE OF BROCTON, N.Y.
STORAGE RESERVOIR PROJECT

CROSS-SECTIONS
THROUGH EARTH EMBANKMENT

NUSSBAUMER AND CLARKE, BUFFALO, N.Y.
CONSULTING ENGINEERS

DRAWN BY E.R.D.	Rev. Upstream slope to 2½:1 JULY 21, 1951	4
DATE JUNE 15, 1951	JOB No. 13500	
SCALE 1"=20' (vertical) 1"=20' (horizontal)	DWG. No. C 5753-4	

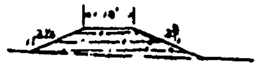
1 2



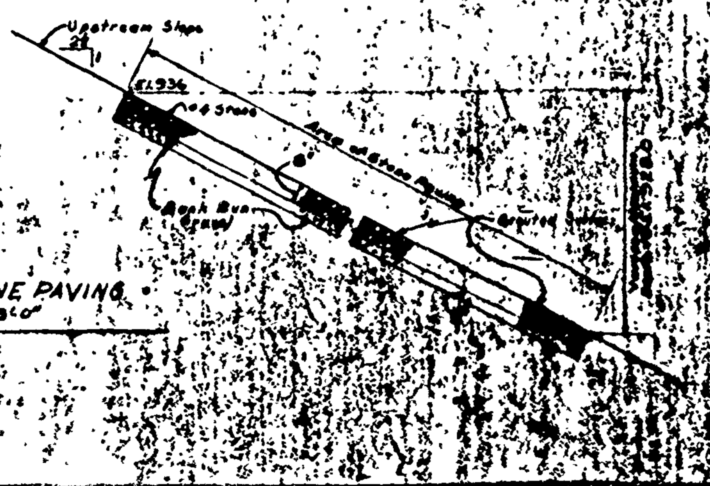
STA. 5-00 E

STA. 5-50 E

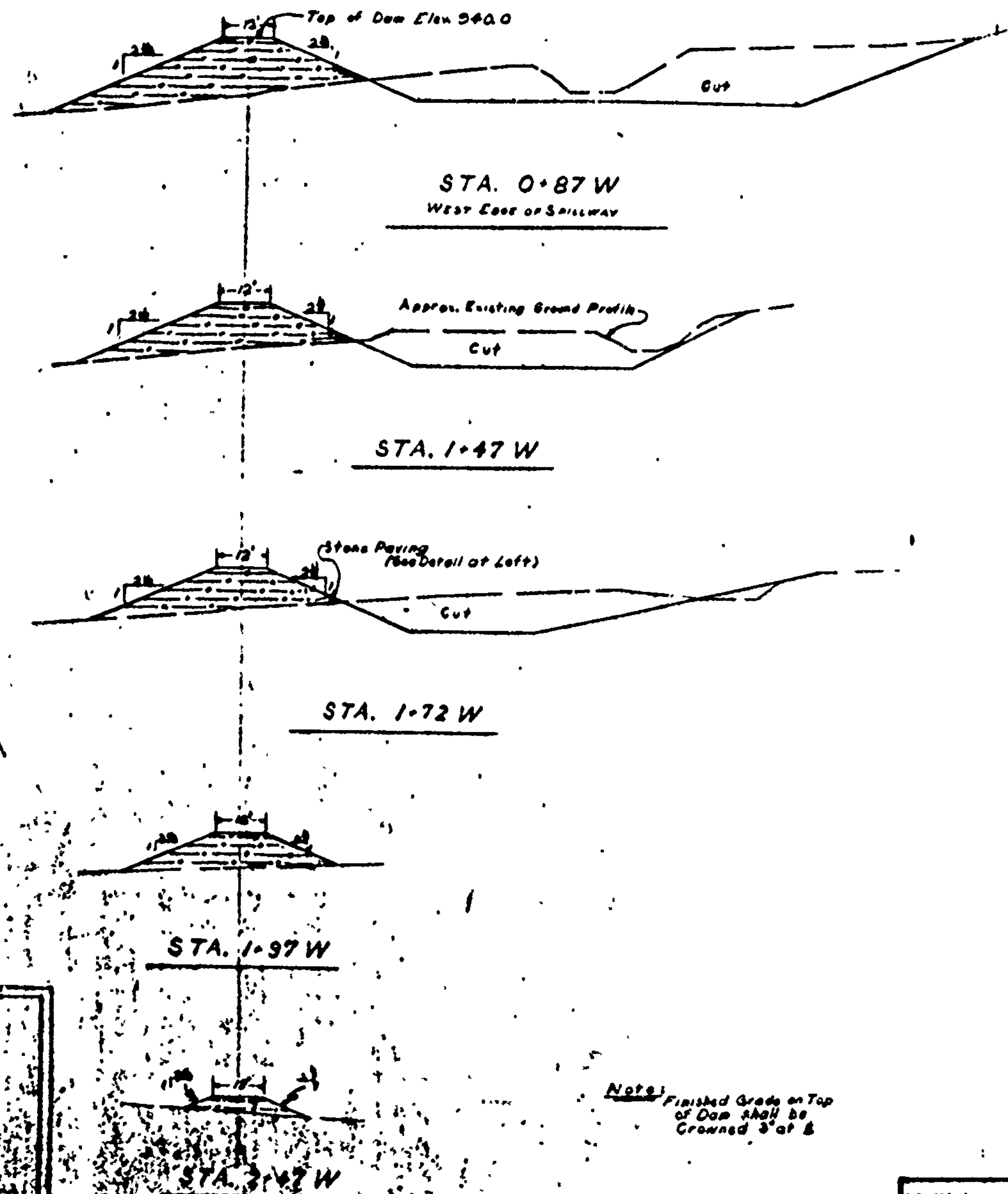
STA. 6-00 E



STA. 6-50 E



DETAIL of STONE PAVING
Scale 1"=3'-0"

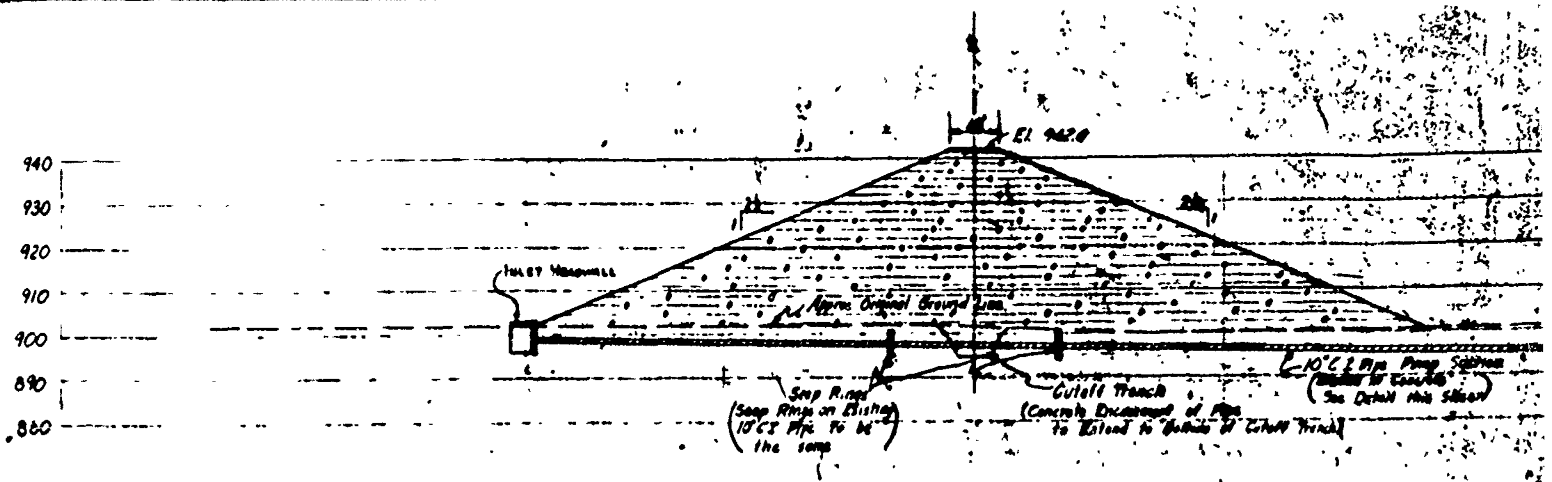


VILLAGE OF BROCTON, N.Y.
STORAGE RESERVOIR PROJECT

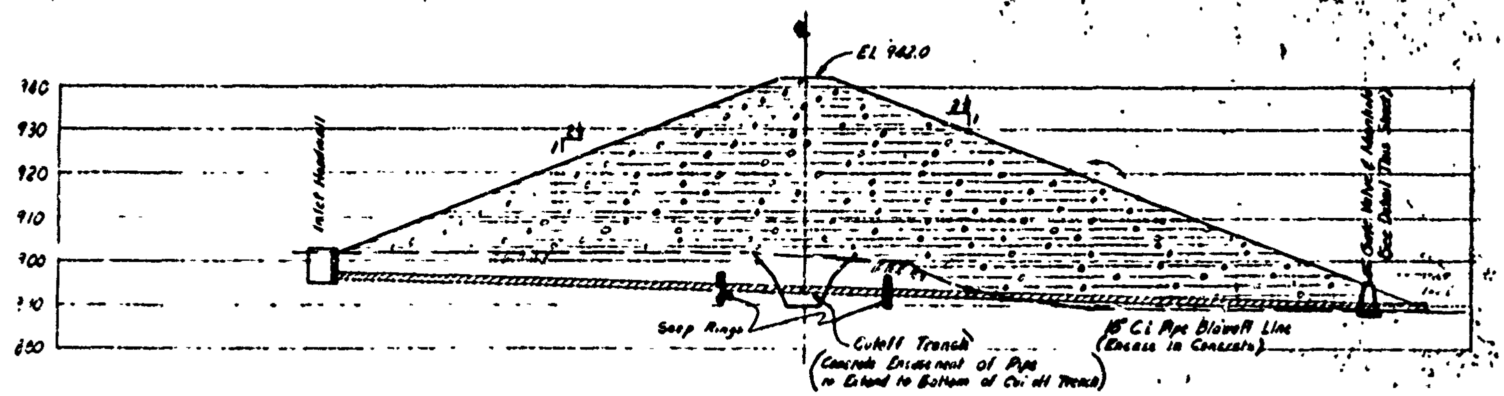
CROSS-SECTIONS THROUGH
EARTH EMBANKMENT &
DETAIL OF STONE PAVING

NUSSBAUMER AND CLARKE, BUFFALO, N.Y.
CONSULTING ENGINEERS

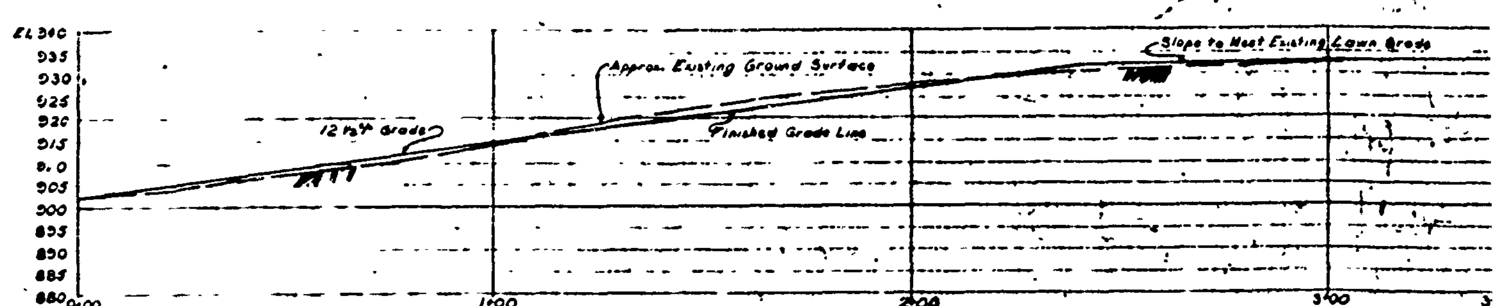
DRAWN BY R.R.B.	Alter. (Upstream Slope to 2½:1) DATE JULY 2, 1951	5
DATE JUNE 15, 1951	JOB No. 13500	
SCALE 1"=20' (vertical) 1"=20' (horizontal)	DWG. No. C 5753-B	



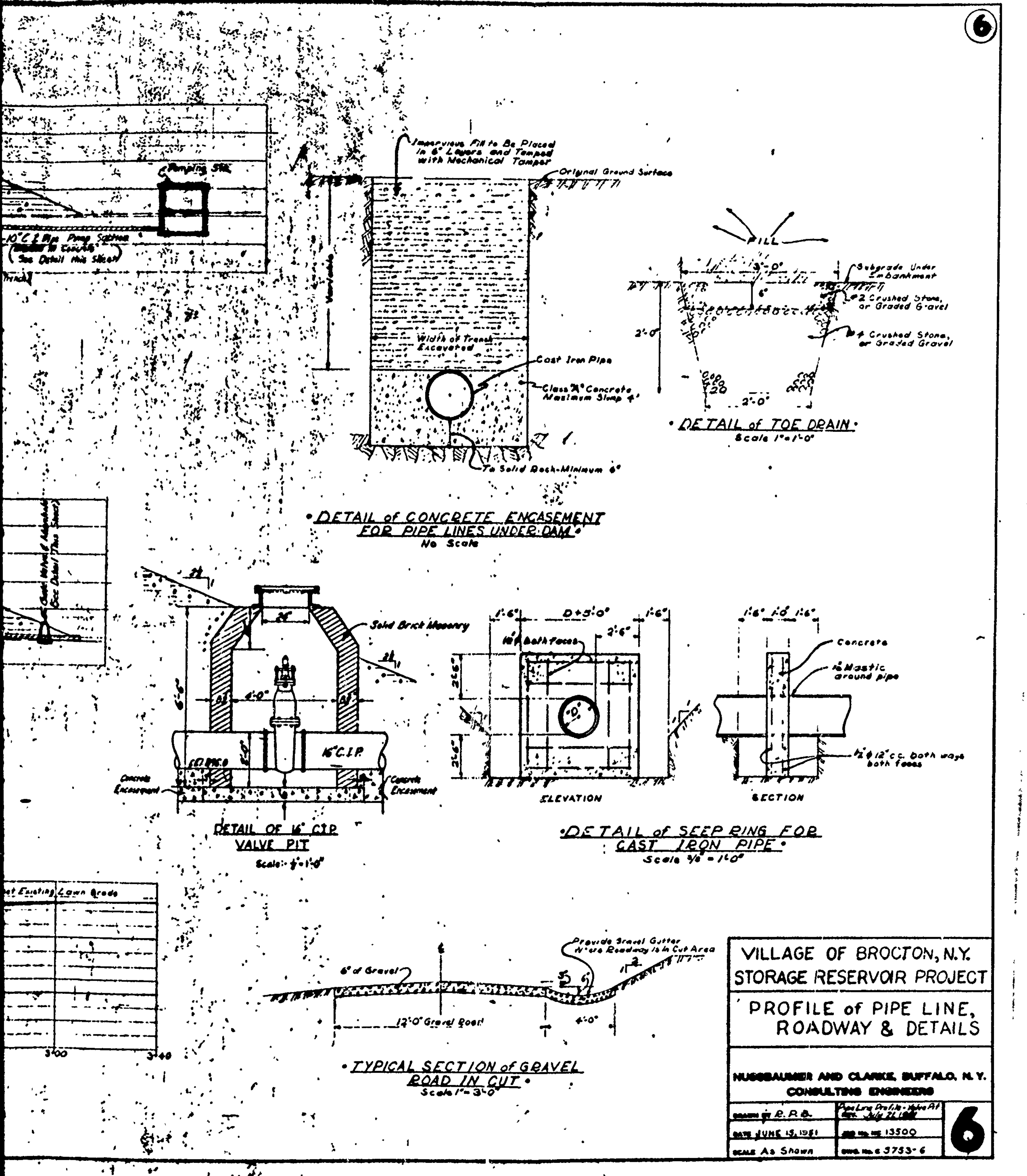
PROFILE OF 10" C.I PIPE PUMP SUCTION LINE
Scale:- 1"=20'-0" (Hor. & Ver.)

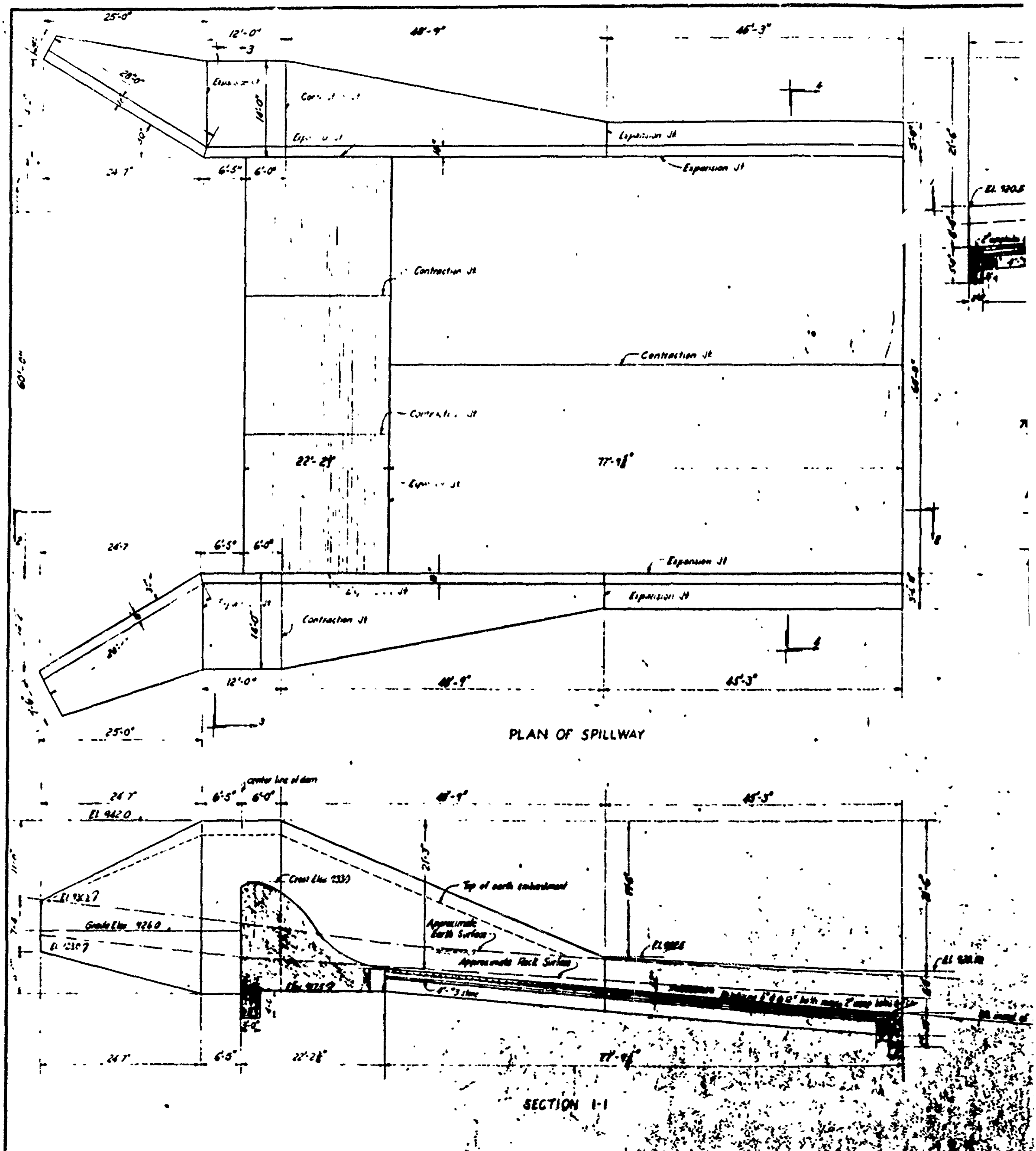


PROFILE OF 16" C.I PIPE BLOWOFF LINE
Scale - 1"=20'-0 (Hor & Ver)



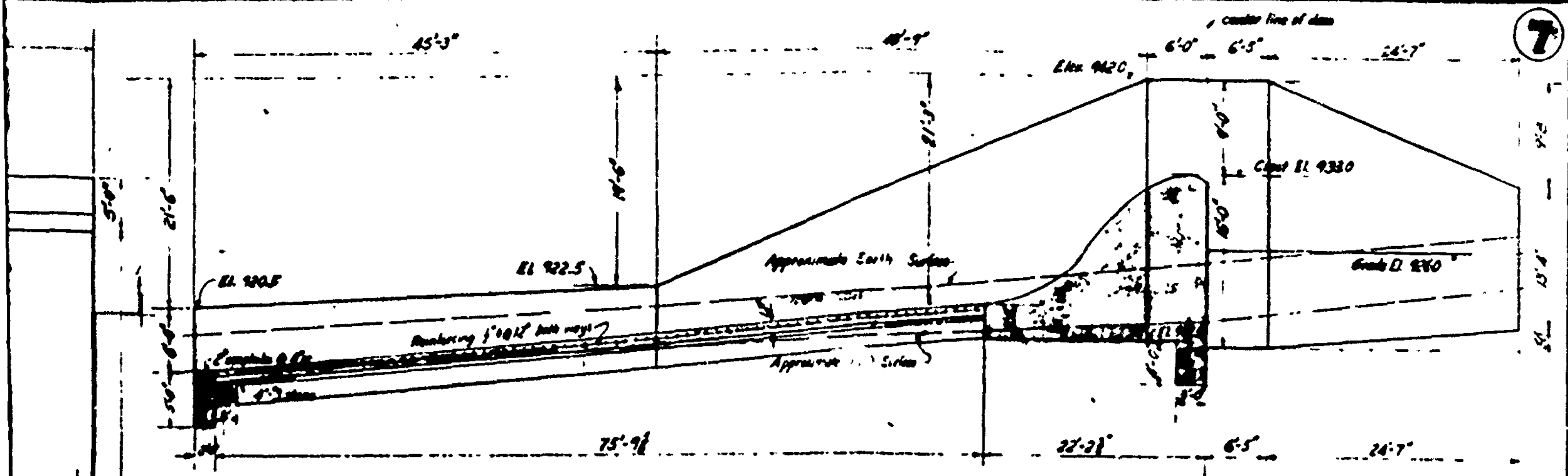
• PROFILE of GRAVEL ROADWAY •
Scale 1"= 20'-0" (Hor. & Vert.)


6
Impervious Fill to Be Placed in 6" Layers and Tamped with Mechanical Tamper
Original Ground Surface
Width of Trench Excavated
Cast Iron Pipe
Class "A" Concrete Maximum Slump 4"
To Solid Rock-Minimum 6"
• DETAIL of CONCRETE ENCASEMENT FOR PIPE LINES UNDER DAM •
No Scale
FILL
Subgrade Under Embankment
#2 Crushed Stone, or Graded Gravel
#4 Crushed Stone, or Graded Gravel
2'-0"
• DETAIL of TOE DRAIN •
Scale 1" = 1'-0"
Pumping Sta.
10" C.I. Pipe Pump Suction
See Detail this Sheet
Solid Brick Masonry
16" C.I.P.
DETAIL OF 16" C.I.P. VALVE PIT
1'-6"
D+5'-0"
2'-6"
both faces
Concrete
Mastic around pipe
1/2" ϕ 12" c.c. both ways both faces
ELEVATION
SECTION
• DETAIL of SEEP RING FOR CAST IRON PIPE •
Scale 3/8" = 1'-0"
Existing Lawn Grade
3+00
3+40
Provide Gravel Gutter Where Roadway is in Cut Area
6" of Gravel
12'-0" Gravel Road
4'-0"
• TYPICAL SECTION of GRAVEL ROAD IN CUT •
Scale 1" = 3'-0"
VILLAGE OF BROCTON, N.Y.
STORAGE RESERVOIR PROJECT
PROFILE of PIPE LINE, ROADWAY & DETAILS
NUSSBAUMER AND CLARKE, BUFFALO, N.Y.
CONSULTING ENGINEERS
DRAWN BY R.P.B.
DATE JUNE 13, 1951
SCALE As Shown
JOB NO. 13500
6

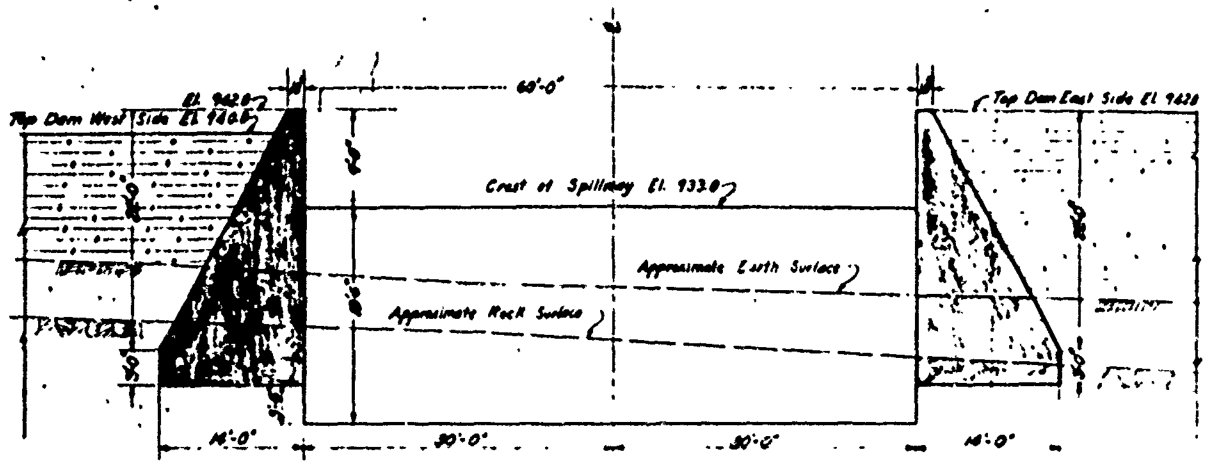


PLAN OF SPILLWAY

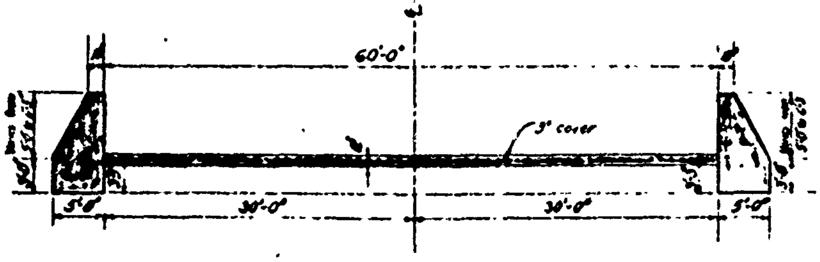
SECTION 1-1



SECTION 2-2



SECTION 3-3



SECTION 4-4

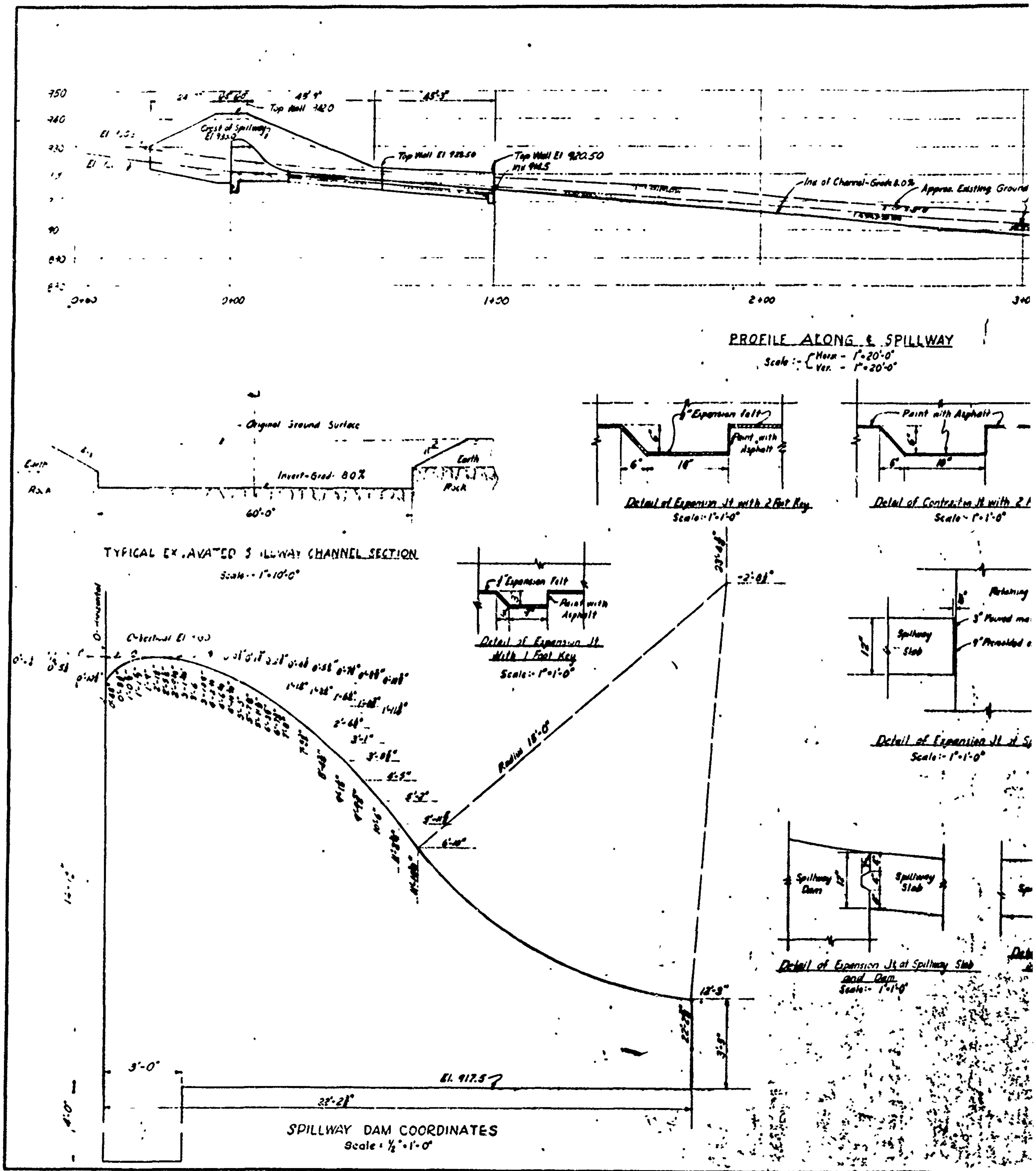
7

VILLAGE OF BROCTON, N.Y.
STORAGE RESERVOIR PROJECT

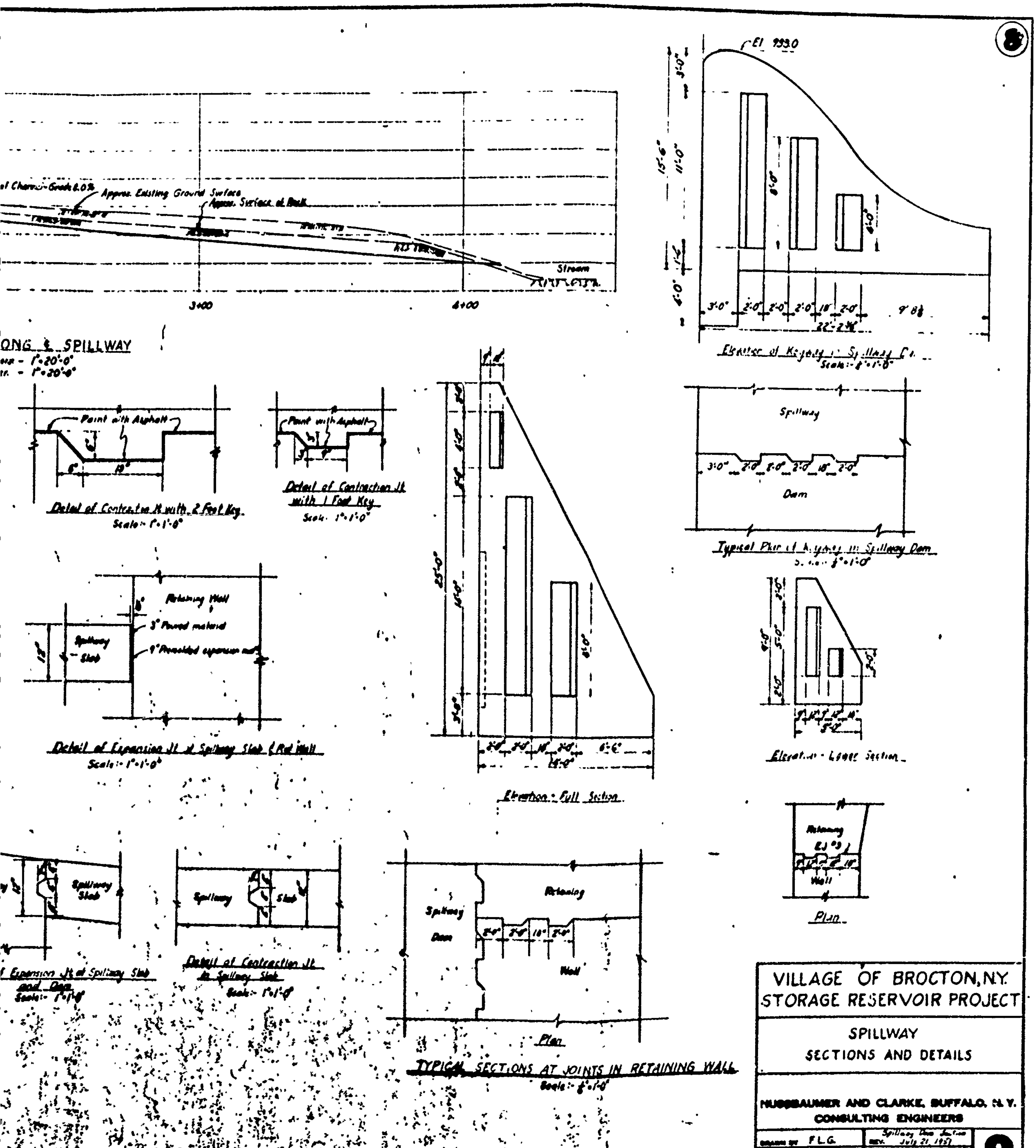
SPILLWAY
PLAN AND SECTIONS

NUSSBAUMER AND CLARKE, BUFFALO, N.Y.
CONSULTING ENGINEERS

DRAWN BY F. L. G.	South End Actual Walls REV. July 21, 1951	7
DATE JUNE 1951	JOB NO. 13500	
SCALE ⅛" = 1'-0"	DWG. NO. C 5753-7	



Top Wall 942.0
Crest of Spillway El 933.0
Top Wall El 928.50
Top Wall El 920.50
Inv 914.5
Inv of Channel-Grade 8.0%
Approx. Existing Ground
0+00
1+00
2+00
PROFILE ALONG ℄ SPILLWAY
Scale :- Horiz - 1"=20'-0" Ver. - 1"=20'-0"
Original Ground Surface
Earth
Rock
Invert-Grad- 8.0%
60'-0"
TYPICAL EXCAVATED SPILLWAY CHANNEL SECTION
Scale - 1"=10'-0"
Expansion Felt
Paint with Asphalt
Detail of Expansion Jt with 2 Foot Key
Scale:- 1"=1'-0"
Detail of Contraction Jt with 2
Scale - 1"=1'-0"
Detail of Expansion Jt With 1 Foot Key
Scale:- 1"=1'-0"
Spillway Slab
Detail of Expansion Jt at S
Scale:- 1"=1'-0"
Spillway Dam
Spillway Slab
Detail of Expansion Jt at Spillway Slab and Dam
Scale:- 1"=1'-0"
Radius 18'-0"
El. 917.5
3'-0"
22'-2½"
SPILLWAY DAM COORDINATES
Scale : ½"=1'-0"



VILLAGE OF BROCTON, N.Y.
STORAGE RESERVOIR PROJECT

SPILLWAY
SECTIONS AND DETAILS

NUSSBAUMER AND CLARKE, BUFFALO, N.Y.
CONSULTING ENGINEERS

DRAWN BY F.L.G.	REV. Spillway Dam Section July 21, 1951	8
DATE JUNE 1951	JOB No. NC 13500	
SCALE AS SHOWN	DWG. No. C 5753-8	